

SAMSON

1994 BIOLOGICAL CHARACTERIZATION
of the
EAST DELTA PROPERTIES

Prepared for the
Department of Water Resources
East Delta Land Management Committee

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SECTION I: PROJECT SUMMARY

A reconnaissance level study of the vegetation, wildlife and natural communities at the East Delta properties was conducted over the spring and summer of 1994. The goal of the study was to characterize the pond properties with respect to plant and wildlife community composition. Vegetation was categorized into 12 plant association types. The different associations are dominated by species such as willow, cottonwood, blackberry, bulrush, cattail, baltic rush, nonnative grasses, and coyote bush. Of the more than 120 plant species observed at the pond properties, approximately half are wetland or riparian species and half are upland species. Though potential habitat exists for seven sensitive plant species, none were observed. One type of rare natural community, the Coastal and Valley Freshwater Marsh, was identified at the pond properties. Fourteen wetland types, as classified by the US Fish and Wildlife Wetland Classification System, were seen in the area. A total of 153 wildlife species were observed or are on record as existing at the ponds, including ten mammals, 132 birds (91 sighted during this study and an additional 41 on record through the Audubon Christmas Bird Count), one amphibian, eight reptiles, and two crustaceans. Potential habitat exists for 34 sensitive wildlife species. Eighteen sensitive species exist at the ponds, including the western pond turtle, giant garter snake, Cooper's hawk, sharp-shinned hawk, ferruginous hawk, common loon, greater sandhill crane, tricolored blackbird, Swainson's hawk, northern harrier, yellow warbler, white-tailed kite, loggerhead shrike, California black rail, and double-crested cormorant. Environmentally sensitive areas were identified based on the following criteria: presence of sensitive species or potential habitat for sensitive species; presence of a rare natural community; and/or classification as a wetland. Each of the East Delta properties have areas which were identified as environmentally sensitive.

SECTION II: GOALS AND OBJECTIVES OF BIOLOGICAL CHARACTERIZATION

A reconnaissance level study of the vegetation, wildlife and natural communities at the East Delta properties was conducted over the spring, summer and fall of 1994. The goal of this study was to characterize the pond properties with respect to plant and wildlife community composition. Specific objectives were the following:

- * To identify and map vegetation.
- * To classify wetland areas using the U.S. Fish and Wildlife Service (USFWS) system.
- * To observe and record sightings of reptiles, amphibians, birds and mammals and describe habitat.
- * To describe potential habitat for sensitive species and to survey for sensitive species occurrences.
- * To identify environmentally sensitive areas, such as wetlands and habitats for rare species

Ultimately, this information will be used by the Department of Water Resources (DWR) to establish management practices for the East Delta properties.

SECTION III: SITE DESCRIPTION AND BACKGROUND

1. Site Description

Between 1974 and 1978 thirteen ponds were created adjacent to Interstate-5 when the land was excavated to provide fill for construction of the freeway. The ponds lie in a north-south orientation approximately 1.0-1.5 miles west of Interstate-5 on land previously designated as Peripheral Canal alignment property. The nine ponds considered in this report, Ponds 5-13, lie on an approximately 14 mile stretch of land between Thornton and Stockton (Figure 1). Pond sites are separated from each other by agricultural land, sloughs or roads, including Highway 12. The source of water to the ponds is ground water flows and precipitation. Prior to excavation, most of the property was in agricultural use.

Measurements of acreage from aerial photographs indicate that pond properties range in size from approximately 64 acres (Pond 8) to 180 acres (Pond 6). Open water at the project sites ranges from 8 acres to 40 acres. Table 1 summarizes information on land and water acreage at each of the ponds.

Each of the ponds is rectangular in shape. Pond 6 differs from the others in that it was formed by a series of shallow parallel cuts, separated by vegetated berms, rather than a uniform deep cut. Shore lines at the ponds vary between gradually sloping banks to vertically cut banks.

Though the ponds are fed primarily by ground water, surface water may periodically enter the ponds from irrigation of adjacent lands or from high flows in adjacent sloughs or canals. The Pond 5 property is bounded on the south end by Beaver Slough. Pond 6 lies just south of Hog

Table 1: Acreage (hectares) of open water and surrounding land of the East Delta properties.

Pond Number	Open Water	Land	Total
5	40 (16)	57 (23)	97 (39)
6	12 (5)	168 (68)	180 (73)
7	31 (12)	70 (29)	101 (41)
8	31 (13)	33 (13)	64 (26)
9	16 (6)	132 (54)	148 (60)
10	24 (10)	130 (52)	154 (62)
11	9 (4)	74 (30)	83 (34)
12	8 (3)	66 (27)	74 (30)
13	28 (11)	60 (25)	88 (36)
TOTAL	199 (80)	790 (321)	989 (401)

Slough and may be tidally influenced by this water channel. Properties at Ponds 7, 8 and 9 are bordered on their west sides by Upland Canal, which feeds the emergent tidal wetlands at Ponds 7 and 9. Highline Canal borders Ponds 10 through 12 and also feeds the emergent tidal wetlands at the Pond 11 property.

2. Soils

The soil most common to the properties is Guard clay loam (California Soil Survey, 1988). This nearly level soil is very deep and poorly drained and is typically found on basin rims. It is formed in alluvium derived from mixed rock sources. In addition to Guard clay loam, several other soil types are found at Pond 5 and Pond 6, including Ryde clay loam, Piper sandy loam, Egbert silty clay loam and Dello loamy sand. These soils also tend to be very deep, poorly drained and nearly level, but they are typically found on natural levees, flood plains and deltas. Formation of these soils occurs in alluvium derived from mixed rock sources, including granite rock, and in hydrophytic plant remains. The California Soil Survey (1988) notes that all of these soil types may be associated with wetland functions and values.

3. Land Use

Various land use practices occur at the pond properties. All of the East Delta properties surveyed in this report except a portion of land at Pond 6 were leased to the California Department of Fish and Game (CDFG) to be managed for wildlife, hunting and fishing. This lease expired in 1985. At Pond 6, 80 acres are leased to a private citizen for cattle grazing; water from Hog Slough is used periodically to irrigate this pasture land. Ponds 9 through 13 form the White Slough Wildlife Area. General maintenance for the ponds, such as weed control, tree pruning, levee repairs and litter removal, is performed by DWR's Division of Flood Management.

Land use on adjacent lands may affect the East Delta properties. The city of Lodi's White Slough Water Pollution Control Plant is located just east of Pond 12. In the spring and summer, effluent and sludge from this plant are applied to agricultural land surrounding the plant. The environmental impact report for the treatment plant identified potential contamination of the East Delta ponds with nitrogen or other pollutants (if agronomic rates of sludge application are exceeded) as a possible significant impact on water quality. It is also possible that irrigation ditches carrying plant effluent may overflow onto East Delta properties. In the winter, plant effluent is released directly into Dredger Cut (between Ponds 12 and 13); this water may then flow in canals to the west of the East Delta properties. Effluent from the treatment plant is required to meet water quality standards, and groundwater wells and receiving waters are monitored at several sites. The Flag City residential development currently under construction at I-5 and Hwy 12 will be building its own water treatment plant. The outfall for that plant's effluent will be on Highline Canal between Ponds 9 and 10.

SECTION IV: REVIEW OF LITERATURE ON SENSITIVE SPECIES AND COMMUNITIES

1. Sources of Background Information

Natural Diversity Data Base

The East Delta pond properties have potential habitat for a number of sensitive species found in the Delta. To determine which sensitive plant and wildlife species might occur in this area, DWR consulted the Natural Diversity Data Base (NDDB), an inventory of the locations of reported sightings of California's sensitive plants, wildlife and natural communities. This database is produced by CDFG's Natural Heritage Division from voluntary sighting reports. Therefore, this database should only be used as a partial indicator of potential sensitive species in a given area. The NDDB collects information on all species and communities of special concern in California which are legally protected at the State or federal level, or which are officially identified as sensitive by the California Native Plant Society (CNPS), The Nature Conservancy, CDFG, The Audubon Society or the NDDB.

DWR biologists retrieved the recorded observations of sensitive plants, animals and communities found within the following U.S. Geological Survey (USGS) quadrangles: Thornton and Terminous, the quadrangles in which the ponds lie, and the ten surrounding quads, Isleton, Bouldin Island, Woodward Island, Holt, Stockton West, Lodi South, Lodi North, Galt, Bruceville, and Courtland (Figure 2). This generated a list of reported occurrences of 22 species including plants, insects, amphibians, reptiles, birds and mammals and five community types.

California Wildlife Habitat Relationship System

The California Wildlife Habitat Relationships System (WHR) was also used to obtain information on wildlife species presence. This system, intended to improve habitat management and conservation, utilizes a data base which contains information on management status, geographic distribution, life history, habitat relationships and requirements and wildlife species' responses to habitat changes (Garrison 1994). Unlike the NDDB, which inventories only sensitive species, the WHR lists all amphibian, reptile, bird and mammal species expected to occur in a given area. Different sets of parameters were used to produce three lists of species potentially occurring in the project area. The first report produced a listing of 145 species and the second

Quadrangles Containing and Adjacent to the East Delta Properties

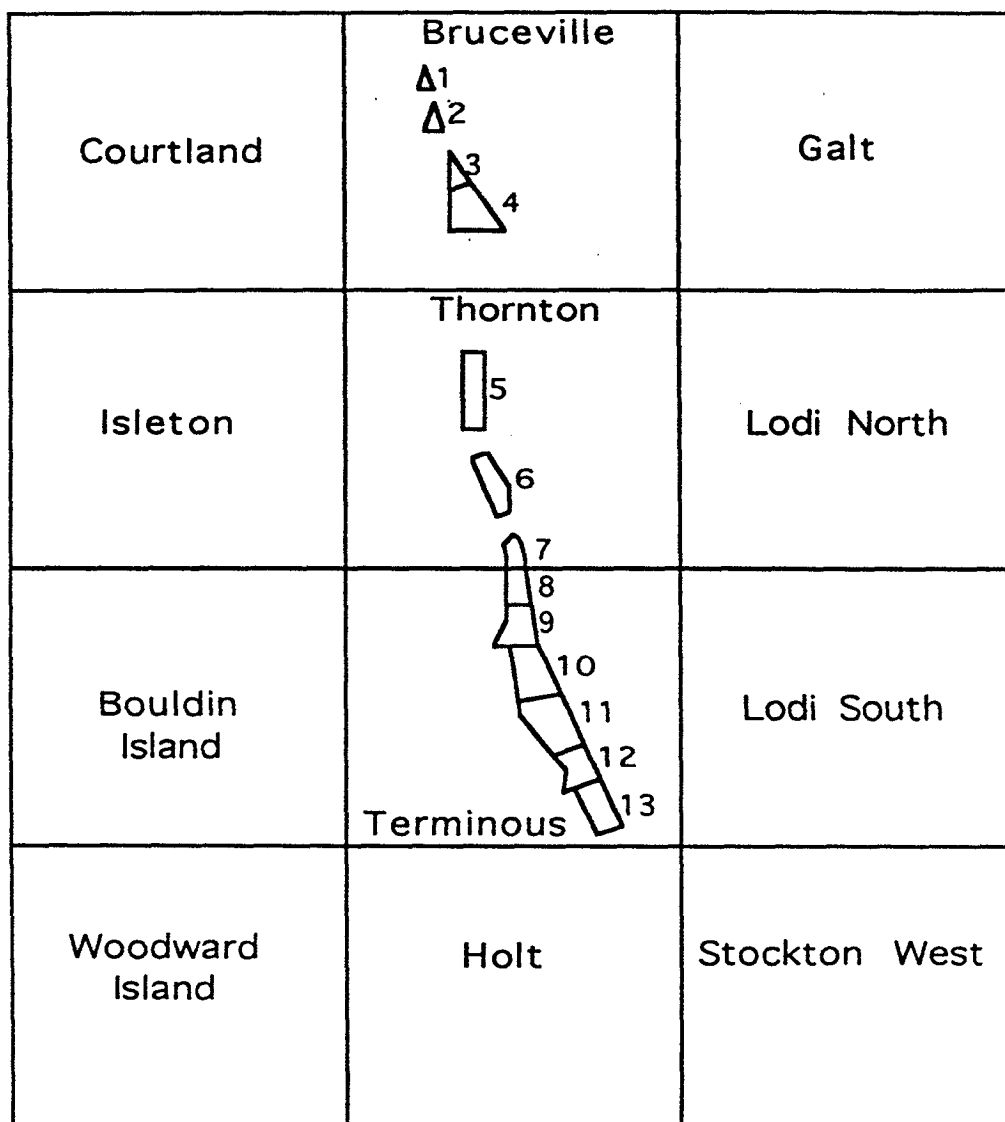


Figure 2: Map of USGS quadrangles which contain or are adjacent to the East Delta Properties. Information from the NDDDB on rare plant and animal species observed in these twelve quadrangles was used to determine which rare species might be present at the properties. Pond numbers are shown next to the appropriate pond. Ponds 1-4 are shown in the figure, though they were not considered in this study.

report a list of 153 species. The final report had the broadest parameters; this report resulted in a list of 200 species. However, these reports can only be used as an indication of which species might occur within the East Delta properties; they are not a complete listing of potentially occurring species. A further complication in using the WHR System is that for some habitats, many of which are found in the Delta, the database still contains a number of errors. Therefore, all results must be scrutinized carefully.

Audubon Society Christmas Bird Count Data

The Audubon Society has been conducting annual Christmas Bird Counts (CBC) since 1899. The counts are held across the Western Hemisphere in mid-December, with the majority occurring in the United States. Each count is conducted within a 15 mile diameter circle. There are now over 1600 counts each year.

The Stockton CBC originated in 1972. One portion of the count circle includes the White Slough Wildlife Area (Ponds 9-13). From nine years of data collection (1984 and 1986 - 1993), a total of 107 bird species were observed (David Yee, pers. comm. 1994). This data is useful in determining the extent to which various bird species use the ponds in the winter.

2. State and Federal Protection Status

Protection is afforded sensitive species in California through the Federal Endangered Species Act (FESA), the California Endangered Species Act (CESA), the Migratory Bird Treaty Act (MBTA), and the Native Plant Protection Act (NPPA). FESA prohibits the taking of species federally listed as endangered, or, if special regulations apply, those federally listed as threatened. Under State law, species may be formally designated rare, threatened or endangered by the California Fish and Game Commission. These State listed species and candidates (those officially under review for listing) are protected from taking by CESA and NPPA. In addition, these laws establish a State policy to conserve, protect, restore, and enhance endangered species and their habitats. Under CESA, State lead agencies are required to consult with CDFG on State projects which may affect listed threatened or endangered species.

The California Environmental Quality Act (CEQA) requires government agencies to consider environmental impacts of projects and to avoid or mitigate them where necessary. If a proposed project is likely to result in a significant impact to a State listed species, or any species which can be shown to meet the criteria for State listing (such as those in the CNPS Inventory on Lists 1 or 2), CEQA requires the project proponent to identify those impacts.

The following terms are used to indicate a species' official status under State or federal law. These definitions conform to those found in California State law and federal regulations.

- Endangered Species:** A species "in danger of extinction throughout all or a significant portion of its range".
- Threatened Species:** A species which is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range".
- Rare Species:** A *plant* species which is "in such small numbers throughout its range that it may become endangered if its present environment worsens".

Species of Special Concern: An *animal* species not legally protected, but officially identified by CDFG as experiencing population decline and/or associated with decreasing habitat.

Sensitive Species: A species which is either legally protected or not legally protected but officially identified as sensitive for reasons such as rarity, low population numbers, or association with decreasing habitat by organizations such as California Native Plant Society (CNPS), The Nature Conservancy (TNC), Audubon Society, or NDDB.

3. Sensitive Plant Species

There are ten sensitive plant species whose known distributions include the project site (Table 2).

Table 2: Threatened, endangered, and sensitive plant species potentially occurring in the East Delta properties area (from the CDFG Natural Diversity Data Base)

Common Name	Scientific Name	Status *	Distribution in California	Habitat
Alkali milk-vetch	<i>Astragalus tener</i> var. <i>tener</i>	CEQA	most of northern CA, including Central Valley	Alkali playas, grasslands, vernal pools
California hibiscus	<i>Hibiscus lasiocarpus</i>	CEQA	Central Valley	fresh water marshes, swamps
Caper-fruited tropidocarpum	<i>Tropidocarpum capparideum</i>	FC2	Central Valley	valley, foothill grasslands
Delta mudwort	<i>Limosella subulata</i>	CEQA	parts of Central Valley, coastal	marshes and swamps
Delta tule pea	<i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	FC2	Central Valley, coastal	coastal, estuarine, and freshwater marshes
Heartscale	<i>Atriplex cordulata</i>	FC2	Central Valley	chenopod scrub, valley and foothill grasslands
Legenere	<i>Legenere limosa</i>	FC2	Central Valley, coastal	vernal pools
Mason's lilacopsis	<i>Lilaeopsis masonii</i>	SR FC2	Central Valley, coastal	brackish, freshwater marshes; riparian
Sanford's arrowhead	<i>Sagittaria sanfordii</i>	FC2	mostly state-wide, including Central Valley	slow-moving fresh water, marshes
Suisun aster	<i>Aster lentus</i>	FC2	Central Valley	brackish, fresh water marshes, swamps

* Status

FE: federally listed, endangered
 FPE: federally proposed, endangered
 FT: federally listed, threatened
 FC1: federal candidate, category 1
 FC2: federal candidate, category 2
 FSS: federally sensitive species

SE: state listed, endangered
 ST: state listed, threatened
 SR: state listed, rare
 SSC: state species of special concern
 SP: state protected
 CEQA: Status of species must be fully considered during preparation of documents related to the California Environmental Quality Act

Alkali milk-vetch (*Astragalus tener* var. *tener*)

Alkali milk-vetch has no special legal protection status, however it must be addressed within the planning framework of CEQA. CNPS describes it as highly restricted in occurrence and endangered in a portion of its range (Skinner and Pavlik 1994). This annual herb, which is endemic to California, occurs in alkali playas, adobe clay grasslands and vernal pools. However, CNPS reports that alkali milk-vetch has not been collected in the Bay Area since 1959 and is protected only at Jepson Prairie Preserve. Habitat destruction, primarily from agricultural conversion, is the main threat to the alkali milk-vetch.

No observations of this plant have been reported in the vicinity of the pond properties since 1927, when it was observed in the Stockton West quadrangle (NDDDB 1993).

California hibiscus (*Hibiscus lasiocarpus*)

California hibiscus is described by CNPS as limited in distribution and endangered in a portion of its range (Skinner and Pavlik 1994). This perennial herb has no legal protection status, however it must be addressed within the planning framework of CEQA. California hibiscus occurs in freshwater marshes on moist river banks and on low peat islands of sloughs. Development, agriculture, recreation and channelization of the Sacramento River and its tributaries threaten this plant. The NDDDB lists several occurrences of this plant within five miles of the East Delta properties, including one occurrence in the wetland adjacent to Pond 11.

Caper-fruited tropidocarpum (*Tropidocarpum capparideum*)

Caper-fruited tropidocarpum is a category 2 federal candidate species. This annual herb is categorized by the CNPS as presumed extinct in California, based on the fact that it has not been seen or collected in the wild in California for many years. According to the CNPS, the last recorded sighting of this plant was in 1957. However, the NDDDB reported an occurrence of this plant in the Woodward Island quadrangle as recent as 1981. Its habitat is grasslands in alkaline hills and valleys.

Delta mudwort (*Limosella subulata*)

Delta mudwort has no special legal protection status, however it must be addressed within the planning framework of CEQA. CNPS identifies this perennial herb as limited in distribution and endangered throughout its range (Skinner and Pavlik 1994). It occurs in marshes and swamps and is threatened by habitat destruction. The NDDDB lists occurrences in the Bouldin Island and Woodward Island quadrangles.

Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*)

The delta tule pea is a category 2 federal candidate species and is identified by CNPS as limited in distribution and endangered in a portion of its range (Skinner and Pavlik 1994). This perennial herb is endemic to California and occurs in coastal, estuarine and freshwater marshes in the Central Valley, especially in the San Francisco Bay Area. Water diversions and agriculture are the two primary threats to these plants. The NDDDB reports several occurrences of the delta tule pea in the general vicinity of the East Delta properties, on the Stockton West, Holt, Woodward Island and Bruceville quadrangles.

Heartscale (*Atriplex cordulata*)

Heartscale is a federal category 2 candidate species and is considered limited in distribution and endangered in a portion of its range (Skinner and Pavlik 1994). This annual herb occurs in chenopod scrub, or sandy or saline valley and foothill grasslands of the Sacramento and San Joaquin valleys. The NDDDB reports an occurrence in the Woodward Island quadrangle.

Legenere (*Legenere limosa*)

Legenere is listed as a federal category 2 candidate species and is considered limited in distribution and endangered throughout its range (Skinner and Pavlik 1994). This annual herb which is endemic to California occurs in vernal pools in the Sacramento and San Joaquin valleys, and San Francisco Bay area. It is primarily threatened by grazing and development. The NDDDB reports several populations in the Galt quadrangle.

Mason's lilaeopsis (*Lilaeopsis masonii*)

Mason's lilaeopsis is listed as a State rare and category 2 federal candidate species and is considered by CNPS as endangered in a portion of its range and limited in distribution (Skinner and Pavlik 1994). This plant is endemic to California and occurs in brackish and freshwater marshes and riparian areas in the Sacramento Valley near San Francisco Bay. Mason's lilaeopsis tends to grow in tidal zones on muddy or silty soils which are subject to erosion and deposition. Threats to this plant include development, flood control projects, recreation, erosion, levee maintenance and agriculture. The NDDDB reports a population of Mason's lilaeopsis within three miles of the East Delta properties.

Sanford's arrowhead (*Sagittaria sanfordii*)

Sanford's arrowhead is a category 2 federal candidate species. The CNPS identifies this perennial herb as limited in distribution and endangered in a portion of its range (Skinner and Pavlik 1994). It occurs in standing or slow-moving freshwater of ponds, marshes and ditches. Sanford's arrowhead is threatened by grazing, development, and channel alteration. The NDDDB lists one population in the Galt quadrangle.

Suisun aster (*Aster lentus*)

The Suisun aster is a category 2 federal candidate species and is identified by the CNPS as limited in distribution and endangered in a portion of its range (Skinner and Pavlik 1994). The perennial herb is endemic to California and occurs in brackish and freshwater marshes of the Sacramento Valley, Central Coast and San Francisco Bay Area. Alteration and loss of marshlands are identified as the key threats to this plant. The NDDDB reports an occurrence of Suisun aster within 6 miles of the pond properties.

4. Sensitive Wildlife Species

There are thirty-four sensitive wildlife species whose known distribution includes the project site (from the CDFG Natural Diversity Data Base); ten of those species are threatened, endangered or proposed for listing and are described below. Table 3 lists those wildlife species that are State or federally listed as threatened or endangered, as well as information about other sensitive wildlife species found in the vicinity.

Table 3. Threatened, endangered, and sensitive wildlife species potentially occurring in the East Delta properties area (from the CDFG Diversity Data Base and other distribution information).

Common Name	Scientific Name	Status**	Distribution in California	Habitat
Valley elderberry longhorn beetle	<i>Desmocerus californicus dimorphus</i>	FT	Central Valley (C. V.)	associated with elderberry bushes
California tiger salamander†	<i>Ambystoma californiense</i>	FC2, SSC	Central Valley and surrounding low foothills	associated with vernal pools
California red-legged frog	<i>Rana aurora draytonii</i>	FPE, SSC	west of Sierras, excluding Central Valley.	drainages, often coastal
Foothill yellow-legged frog†	<i>Rana boylei</i>	FC2, SSC	foothills surrounding the C.V., also the Sutter Buttes	streams and rivers
Western pond turtle*	<i>Clemmys marmorata</i>	FC2, SSC	in C.V. north of Fresno, California coast	permanent water with cover and basking sites
Giant garter snake*	<i>Thamnophis couchi gigas</i>	FT, ST	Central Valley wetlands	slow water with cover
Cooper's hawk*	<i>Accipiter cooperii</i>	SSC	statewide	broken woodlands
Sharp-shinned hawk*#	<i>Accipiter striatus</i>	SSC	statewide	mixed woodlands
Tricolored blackbird*#	<i>Agelaius tricolor</i>	FC2, SSC	C.V., central and south coast	meadows, marshes
Golden eagle	<i>Aquila chrysaetos</i>	SSC, SP	statewide	hilly, open terrain
Short-eared owl =	<i>Asio flammeus</i>	SSC	statewide	marshes, field, grasslands
Long-eared owl	<i>Asio otus</i>	SSC	statewide	thick woods
Burrowing owl	<i>Athene cunicularia</i>	SSC	most of state, including C.V.	dry and open uplands
Ferruginous hawk*	<i>Buteo regalis</i>	SSC	all but north coast	open spaces
Swainson's hawk*	<i>Buteo swainsoni</i>	ST	Central Valley and Great Basin	grasslands or some crops
Northern harrier*#	<i>Circus cyaneus</i>	SSC	all but southern desert areas	wetlands, open fields
Western yellow-billed cuckoo†	<i>Coccyzus americanus occidentalis</i>	SE	Central Valley, lower Colorado River	cottonwood or willow riparian areas
Yellow warbler*	<i>Dendroica petechia</i>	SSC	statewide	riparian woodlands
White-tailed kite*#	<i>Elanus caeruleus</i>	SP	coast, Central Valley	grasslands, farmlands
Merlin =	<i>Falco columbarius</i>	SSC	all but Great Basin	various
Prairie falcon #	<i>Falco mexicanus</i>	SSC	from C.V. east through Sierras	dry, open country
American peregrine falcon	<i>Falco peregrinus anatum</i>	FE, SE, SP	coast, Lake Tahoe area	open land near cliffs
Common loon*	<i>Gavia immer</i>	FSS, SSC	coastal, some inland	coastal or inland waters
Greater sandhill crane*#	<i>Grus canadensis tabida</i>	ST, SP	Great Basin, C.V. (winter)	wetlands, flooded fields

Common Name	Scientific Name	Status**	Distribution in California	Habitat
Bald eagle	<i>Haliaeetus leucocephalus</i>	FE, SE	statewide, mostly Klamath area	rivers, lakes, estuaries
Loggerhead shrike*#	<i>Lanius ludovicianus</i>	SSC	all but extreme north coast	open or brushy areas
California black rail*	<i>Laterallus jamaicensis coturniculus</i>	ST, FC1	Sacramento-San Joaquin Delta	marshes, swamps
American white pelican	<i>Pelecanus erythrorhynchos</i>	FSS, SSC	Klamath area, S.F. estuary	lakes and estuaries
Double-crested cormorant*#	<i>Phalacrocorax auritus</i>	SSC	coast, inland lakes and rivers	permanent waters with sufficient food
Purple martin	<i>Pogon subis</i>	SSC	all but desert areas	open country
Pallid bat	<i>Antrozous pallidus</i>	SSC	all but extreme north coast	prefers rocky outcrops
California mastiff bat	<i>Eumops perotis californicus</i>	SSC	southern half, west of Sierras	crevices, buildings
Townsend's big-eared bat	<i>Plecotus townsendii</i>	SSC	statewide	caves, buildings
San Joaquin kit fox†	<i>Vulpes macrotis mutica</i>	FE, ST	San Joaquin Valley	dry grasslands

† Species not expected to be at project sites because of lack of appropriate habitat, although property is within the species' range.

* Species actually observed during 1994 field work.

Species sighted at the White Slough Wildlife Area during the Audubon Christmas Bird Counts

** Status

FE: federally listed, endangered

FPE: federally proposed, endangered

FT: federally listed, threatened

FC1: federal candidate, category 1

FC2: federal candidate, category 2

FSS: federally sensitive species

SE: state listed, endangered

ST: state listed, threatened

SR: state listed, rare

SSC: state species of special concern

SP: state protected, CDFG

CEQA: status of species must be fully considered during preparation of documents related to the California Environmental Quality Act

Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)

The valley elderberry longhorn beetle is listed as a federally threatened species but has no State protective status. This species has declined drastically in California as a result of habitat losses. More than 90% of its original Central Valley habitat has been lost (Steinhart 1990).

The beetle is found only in California's Central Valley, and all life stages of the species are dependent on the elderberry bush as a food source and shelter (Steinhart 1990). The NDDB contains a record of valley elderberry longhorn beetles from the Bruceville quad.

California red-legged frog (*Rana aurora draytonii*)

The California red-legged frog has been proposed for listing as a federally endangered species and is designated as a State species of special concern (USFWS 1994, Steinhart 1990). In California less than 75% of the sites with historical populations currently have extant populations of the frog (Hayes and Jennings 1988). A large decline probably occurred in the latter half of the nineteenth century when large numbers of frogs were harvested (Jennings and Hayes 1985). Other factors contributing to the decline of the species include loss of habitat, and predation and competition with introduced fish and frog species (Hayes and Jennings 1986, Schwalbe and Rosen 1988).

The frog's range is currently restricted to areas west of the Sierra, excluding the Central Valley (Stebbins 1985). Red-legged frogs are usually found in coastal drainages with the proper combination of aquatic and riparian habitat components; there are now only three known sites with populations greater than 350 individuals (USFWS 1994). Although the East Delta properties are within the historic range of the California red-legged frog, the NDDDB contains no records of their occurrence there.

Giant garter snake (*Thamnophis couchi gigas*)

The giant garter snake is listed as both a federal and a State threatened species (NBS 1994). The declining population of the giant garter snake has been attributed to many factors, including pesticides, introduced predators, pollution, and loss of habitat (Morey 1985, Hansen 1988). A study in 1988 found no giant garter snakes in the "Delta proper", possibly due to extensive modifications of the main channels (Hansen 1988).

This species is an aquatic snake found in Central Valley wetlands; its range consists of isolated patches from Butte County to Fresno County. It is found in still or slow moving water with dirt banks and mud bottoms, and usually avoids large bodies of water because of the presence of predatory fishes. Giant garter snakes require habitat with cover, both in and out of the water, as well as access to higher ground in case of flooding (Brode 1988).

The NDDDB records sightings of giant garter snakes on several quads in the vicinity of the project site, including Bruceville, Galt, Lodi South, Stockton West, Terminous, and Thornton. Most of these sightings are at a distance from the ponds; however, three of the sightings were within the White Slough Wildlife Area (Terminous quad).

Swainson's hawk (*Buteo swainsoni*)

The Swainson's hawk is listed as a State threatened species; it has no federal status (NDDDB 1994). This species has declined drastically in the twentieth century. One of the primary causes of this decline is reduced nesting and foraging habitat because of urban and agricultural expansion. The population may also face threats during its yearly migration or on the wintering grounds in South America (CDFG 1993).

This hawk requires suitable nesting habitat (mature trees in riparian forests, groves, or lone trees) that is adjacent to foraging habitat (large open areas of grassland or certain crop types). The NDDDB contains many recorded sightings of Swainson's hawks on Bouldin Island, Bruceville, Courtland, Galt, Holt, Isleton, Lodi North, Lodi South, Stockton West, and Thornton quads. Of these reported observations, only two are in close proximity to the project area; both

are within one mile of Pond 5. Information on Swainson's hawks was also provided by Jim Estep, a biologist who has worked extensively with Swainson's hawks. Estep surveyed the general area of the East Delta properties in 1990, and found no nesting birds, although he did occasionally see them foraging (pers. comm. 1994). Estep also related, however, that there is a Swainson's nest site southeast of Pond 13, and two unconfirmed nesting sites within one mile of Pond 5.

Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)

The western yellow-billed cuckoo has no federal status but is State listed as an endangered species (NDDDB 1994). Like many other birds, this species has also suffered serious declines as a result of lost habitat. California's population had declined to less than 85 pairs in 1987. Drought and reductions in the prey base due to pesticides may also be at fault (Ehrlich *et al.* 1992).

This species is a neotropical migrant, spending winters in South America and the breeding season in western North America (although it now no longer breeds in British Columbia, Washington, or Oregon). It is restricted to nesting in tall cottonwood and willow riparian woodlands (Ehrlich *et al.* 1992).

The NDDDB (1994) contains no records of western yellow-billed cuckoos in the vicinity of the East Delta properties. The Sacramento Audubon Society (1987) records indicate that, although this species may move through the Sacramento area during migration, it no longer breeds here.

American peregrine falcon (*Falco peregrinus anatum*)

The peregrine falcon is listed as both a federal and State endangered species, as well as a State fully protected species. In 1983 the number of breeding pairs of falcons in the western United States had dropped to 200. Today that number has increased to approximately 400 pairs. The decline of the American peregrine falcon is primarily due to eggshell thinning, caused by pesticide and PCB contamination of the foodchain (Ehrlich *et al.* 1992).

Historically the falcon nested on cliff ledges adjacent to open habitat, but it has adapted fairly well to human environments and now commonly uses bridges and tall urban buildings as nest sites (Ehrlich *et al.* 1992). Peregrines prey on birds in flight and are therefore able to hunt over a variety of habitats. The NDDDB does not contain any records of peregrine falcon sightings in the vicinity of the project site.

Greater sandhill crane (*Grus canadensis tabida*)

The greater sandhill crane is listed on the USFWS Sensitive Species List and is listed as a State threatened species. There are four breeding populations of the cranes, one of which winters in the Central Valley. The crane populations were initially protected from hunting in the 1930s. Since then their populations have steadily increased. It is estimated that the Central Valley population consists of 2600-3600 birds (Pogson and Lindstedt 1988, 1991).

Greater sandhill cranes are migratory, spending the spring and summer as far north as British Columbia and returning to the Central Valley in the winter. Shifts in Central Valley land use patterns have reduced the availability of appropriate foraging habitat (permanent and seasonal wetlands) for the wintering cranes (Pogson and Lindstedt 1988, 1991). The NDDDB does not contain any records of sightings of greater sandhill cranes near the East Delta properties.

However, the Woodbridge Ecological Reserve, west of Pond 6, is a reserve managed by CDFG specifically to provide wintering habitat for the greater sandhill crane.

Bald eagle (*Haliaeetus leucocephalus*)

The bald eagle is listed as both a State and federal endangered species. Approximately 70% of the nation's breeding population was lost between 1945 and 1972, mostly due to pesticides (Harvey *et al.* 1992). Numbers have been increasing since the 1970s, and the USFWS may reduce the bird's status from endangered to threatened (Associated Press 1993).

The eagle can be found in California during the winter, when about 800 birds are in the state. Approximately 40% of the state's wintering population is located in the Klamath Basin, with the remaining 60% distributed throughout the state where habitat is suitable. The bird is usually found associated with lakes, rivers, or estuaries. In the San Francisco Bay area, eagles typically inhabit the northern and eastern peripheries of the estuary (Harvey *et al.* 1992). The NDDDB does not contain any records of bald eagles near the project site.

California black rail (*Laterallus jamaicensis coturniculus*)

California black rail (*Laterallus jamaicensis coturniculus*) is listed as threatened under the California Endangered Species Act and is a Category 1 candidate species for federal listing. The historic range of the species included the tidal salt marshes of San Francisco Bay and San Pablo Bay, brackish tidal marshes of Suisun Bay, and freshwater marshes of the Sacramento - San Joaquin Delta (Harvey *et al.* 1992). California black rails were also known to the Pacific coastal marshes south of San Francisco Bay to San Quentin, Baja California; and the Imperial Valley and lower Colorado River Valley in southeastern California and southwestern Arizona (Ehrlich *et al.* 1992). The species has been extirpated from San Diego County. The California black rail population has been in progressive decline due to tidal wetland habitat loss and degradation. At least 80% of the remaining population is confined to the northern reaches of the San Francisco Bay estuary, especially the tidal marshlands associated with San Pablo Bay and associated rivers (Evens *et al.* 1992).

California black rails have a scattered distribution on mid-river bench islands (elongated, planar, elevated marshlands) throughout the Sacramento-San Joaquin Delta. Given the scarcity of such habitat, the population is thought to be small. California Department of Fish and Game personnel first discovered black rails calling in *Scirpus/Typha* wetland habitat at the White Slough Marsh in the summer of 1974. The rails have been heard in this marsh every year since 1974. They are also known to the *Scirpus/Typha* marsh in the headwaters area of White Slough. They are specifically known to the bench islands at the Little Potato Slough/White Slough confluence. Small populations of black rails are also known to the bench islands of Middle River (near Bacon and Woodward Islands) and to Old River east of Holland Tract.

San Joaquin kit fox (*Vulpes macrotis mutica*)

The San Joaquin kit fox is listed as federally endangered and State threatened. This subspecies was once widespread within the Central Valley, but loss of habitat due to agricultural, industrial, and urban expansion led to its decline (Orloff *et al.* 1986).

This subspecies is currently found in southern San Joaquin Valley and in the arid foothills bordering the valley on the west as far north as Byron. It is found most often in habitats that support large numbers of kangaroo rats, a common prey item (Jensen 1972). However, in the extreme northern part of its range, there is evidence that ground squirrels are its primary food source (Orloff *et al.* 1986). The NDDDB contains a reference to observations of the San Joaquin kit fox within San Joaquin county. These observations probably occurred south of the East Delta properties, in what is currently the known range of the kit fox, but the exact location is unknown because the NDDDB record contains an incomplete listing of quads.

4. Rare Natural Communities

While species-oriented management is necessary to protect California's most sensitive plant and wildlife species, a broader scale approach is required to maintain the viability of its more common species. The aim of the NDDDB's Natural Communities program is to provide information on the health, distribution and abundance of California's various natural communities, as a way of gauging the fitness of their component species. In this way, the Natural Communities program acts as a "coarse filter" to keep track of the condition of the majority of the state's biota (Holland 1986). The NDDDB assigns to each community type a ranking which reflects the rarity and endangerment of the community within California (NDDDB 1993).

Five different types of rare communities were listed in the NDDDB in the area of the East Delta properties (Table 4). The following paragraphs describe these communities (Holland 1986).

Coastal and Valley Freshwater Marshes

Coastal and Valley freshwater marshes are dominated by emergent monocots such as *Scirpus* and *Typha* which often form closed canopies. The soils are typically deep and peaty due to permanent flooding. These marshes occur in areas where there is little current, in coastal valleys near river mouths and around the margins of lakes and springs. Freshwater marshes are found most commonly in the Sacramento-San Joaquin River Delta in river oxbows and areas of the flood plain.

Coastal and Valley freshwater marshes are ranked as very threatened, according to the State-Wide Rank assigned by the NDDDB staff. This ranking indicates that less than 10,000 acres of coastal and valley freshwater marshes still exist in California. Water diversions and development are the key threats to this habitat type. Several freshwater marshes are reported to occur within five miles of the East Delta properties (NDDDB 1993).

Great Valley Mixed Riparian

Great Valley mixed riparian forests are composed of tall, winter-deciduous, broadleaved trees. The canopy is typically dense and includes *Acer negundo californica*, *Juglans hindsii*, *Platanus racemosa*, *Populus fremontii* and various species of *Salix*. Understories consist of *Cephalanthus occidentalis* and *Fraxinus latifolia*. These communities tend to occur in floodplains of low-gradient, depositional streams of the Great Valley and were once extensive in the Sacramento and northern San Joaquin valleys.

Table 4: Rare natural communities potentially occurring in the East Delta properties (from the CDFG Natural Diversity Data Base).

Community	Status *	Physical Characteristic	Associated Vegetation	Range
Coastal Valley Freshwater Marsh	S2.1	Flooded areas with little current (river mouths, lake margins), peaty soil	Emergent plants: <i>Scirpus</i> , <i>Typha</i> , <i>Sagittaria</i> , <i>Potentilla</i>	Sacramento and San Joaquin valleys
Great Valley Mixed Riparian Forest	S2.1	Floodplains of low-gradient, depositional streams	Tall, broadleaf trees: <i>Acer</i> , <i>Juglans</i> , <i>Platanus</i> , <i>Populus</i> , <i>Salix</i>	Sacramento/ north. San Joaquin valleys
Great Valley Valley Oak Riparian Forest	S1.1	Above active river channels; soil receives inputs of silty alluvium and subsurface irrigation	Med.-tall broadleaf trees: <i>Quercus</i> , <i>Fraxinus</i> , <i>Juglans</i> , <i>Platanus</i>	Sacramento/ north. San Joaquin valleys
Northern Hardpan Vernal Pool	S3	Old very acidic hardpan soil	Low, amphibious, herbaceous community, annual herbs and grasses	Tulare Fresno County north to Shasta County
Valley Oak Woodland	S2.1	Deep, well-drained alluvial soils, on relatively moist valley floors	<i>Quercus</i> , <i>Elymus</i> , <i>Toxicodendron</i>	Sacramento/ San Joaquin valley; coastal range valleys

* State rank

S1 = Less than 2000 acres

S1.1 = very threatened

S1.2 = threatened

S1.3 = no current threats known

S2 = 2000 - 10,000 acres

S2.1 = very threatened

S2.2 = threatened

S2.3 = no current threats known

S3 = Between 10,000 and 50,000 acres

S3.1 = very threatened

S3.2 = threatened

S3.3 = no current threats known

Great Valley mixed riparian forests are considered to be very threatened, with less than 10,000 acres still in the State. Agriculture, flood control and urban expansion have eliminated many of these communities. The NDDB reports one such community in the Bruceville quad.

Great Valley Valley Oak Riparian Forest

Great Valley valley oak riparian forests have a medium to tall upper canopy dominated by broadleafed, winter deciduous trees, primarily *Quercus lobata*. The understories are composed of *Fraxinus latifolia*, *Juglans hindsii*, and *Platanus racemosa* and young *Q. lobata*. These communities occur above active river channels and thus are not heavily impacted by flooding, though they do receive inputs of silty alluvium and subsurface irrigation. Great Valley valley oak riparian forests were previously extensive on low-gradient, depositional reaches of the Sacramento and northern San Joaquin valleys.

These communities are ranked as very threatened. This ranking indicates that less than 2000 acres of this habitat exists in California. Agriculture and firewood harvesting have virtually eliminated this habitat type. The NDDDB reports one such community within three miles of Pond 5 and several in the Galt and Bruceville quadrangles.

Northern Hardpan Vernal Pool

This low, amphibious, herbaceous community is dominated by annual herbs and grasses. Germination and growth begin in the winter when the plants are inundated and continue into the spring and summer as the pools dry down. This type of vernal pool occurs in areas with old, very acidic hardpan soils. It is found on the east side of the Great Valley, from Tulare or Fresno County north to Shasta County.

This habitat type is identified as threatened, as less than 50,000 acres of Northern hardpan vernal pool still exist in California. Several communities exist in the Galt and Bruceville quadrangles.

Valley Oak Woodland

This woodland is characterized by a relatively open canopy dominated by *Quercus lobata* and a grassy under-storied savanna. Canopy cover is low, usually 30-40%. Other species common to this community are *Elymus triticoides* and *Toxicodendron diversilobum*. These communities typically occur in valley bottoms which have deep alluvial soils. Distribution includes the Sacramento and San Joaquin valleys adjacent to the Sierra Nevada foothills and valleys of the coastal range from Lake County to western Los Angeles County.

These communities are identified as very threatened, with less than 10,000 acres occurring in California. Several communities occur in the Lodi South and Bruceville quadrangles.

SECTION V: METHODS OF VEGETATION AND WILDLIFE CHARACTERIZATION

1. Introduction to Methods

The East Delta Properties biological characterization consisted of a reconnaissance level evaluation of the vegetation, wildlife and habitats present on the properties. Most field work was conducted between March and September 1994 by DWR biologists, though there was one additional site visit in November. The spring-summer period was emphasized because it is the time when plant identification is easiest, as most plants are in flower and annual plants are present. The wildlife characterization was done in conjunction with the vegetation field work. It is probable that certain plant and wildlife species present on the properties were not observed during field work, due to the project time frame.

2. Vegetation Characterization and Mapping

Enlarged 1:24000 color aerial photographs were used to map vegetation. Before field work began, areas with varying photographic "signatures" (differences in color and texture on the photograph which indicate changes in vegetation type) were delineated on acetate overlays. In the field, representative areas were ground truthed and plant species composition and

environmental information was recorded on data sheets. The 81 data points generated in this way were then compared, and those with similar dominant species were grouped into plant associations. The lines around vegetation types on the overlays were revised and labeled with the appropriate plant association type. Acreages of each plant association were determined using a planimeter.

3. Wetland Classification

A map of the types of wetlands found at the East Delta properties was prepared by modifying wetland maps prepared by the National Wetlands Inventory (USFWS). These maps use the classification system found in "Classification of Wetlands and Deepwater Habitats of the United States" by the U. S. Fish and Wildlife Service (1979) which defines wetlands by the plants present, the type of substrate, and the frequency of flooding.

During the vegetation mapping, limited hydrologic and other environmental information was collected at each data point. For example, information on areas which are tidally flooded, connected to sloughs by tide gates, bordering bodies of water, or bordering uplands, was recorded. Since the field work was conducted in the late spring and summer only, areas affected by seasonal flooding were not apparent (though flooding could sometimes be inferred).

4. Sensitive Plant Species and Rare Natural Communities Survey Methods

Potential habitat for the ten sensitive plant species identified in the NDDB search was noted during the vegetation mapping field work. Sensitive species surveys were conducted by walking or canoeing through appropriate habitat. Surveys for Mason's lilaeopsis and Delta mudwort were done at low tide so that the intertidal zone was exposed. Surveys for Suisun aster, Delta tule pea, Sanford's arrowhead, and California hibiscus were done at high tide, when necessary, to allow for access into tidal channels which penetrate marsh areas. Searches for heartscale were conducted when alkaline areas with grasslands were encountered in the vegetation mapping field work. All surveys were conducted when each species was visible and identifiable.

Examples of five sensitive natural communities were identified in the NDDB. Presence of these communities or potential for them to develop was noted during the vegetation mapping.

5. Wildlife: General Field Observations

Data on wildlife species present at the East Delta properties was obtained by making incidental observations while walking through the project area with minimal disturbance to microhabitats. A list was compiled of species which were seen during daylight hours in the spring, summer and fall seasons.

6. Sensitive Wildlife Species Survey Methods

The NDDB contained records of occurrences near the project area of four threatened or endangered species. As a result of these records, DWR biologists decided to survey specifically for these species, as well as the greater sandhill crane. Methods for these sensitive species surveys are described below.

Valley elderberry longhorn beetle

Field surveys for the valley elderberry longhorn beetle, *Desmocerus californicus dimorphus*, were done in conjunction with vegetation surveys because of the beetle's close association with elderberry bushes. If any bushes were identified, their locations were to be mapped, and the bushes examined for the presence of adult beetles and emergence holes in the stems.

Giant garter snakes

Field surveys for the giant garter snake, *Thamnophis couchi gigas*, consisted of incidental observations made by consulting environmental biologist, George Hansen. The first reported sighting of giant garter snakes within the project area was in 1974, in the vicinity of Pond 9. Hansen has observed the snakes on the East Delta properties since he began surveying for them there in 1976. In 1994 he searched all nine ponds, as well as any corridors connecting the ponds which contained potential habitat.

Swainson's hawks

Field surveys for Swainson's hawks, *Buteo swainsoni*, consisted of incidental observations made while walking around the project site as well as searches for nest sites. All trees of suitable size for nesting raptors were scanned with binoculars from all possible angles. When an appropriately sized nest was located, it was further monitored until the species using it could be identified.

California black rails

Survey methodology followed techniques described by Evens *et al.* (1989). Census stations were established in and around high marsh tidal wetland habitat in the project area. Surveys were limited to the time window beginning two hours before sunrise and ending two hours after sunrise. Census techniques included observation, listening for voluntary vocalization, and eliciting vocalization response to taped calls. Potential habitat is present in the emergent tidal marsh west of Ponds 7, 9 and 11. Surveys for black rails were conducted in late March during the time that spontaneous black rail vocalizations were being detected in other surveys in Suisun Marsh.

Greater sandhill cranes

Surveys for greater sandhill cranes, *Grus canadensis tabida*, consisted of incidental observations made while walking or driving through the project area.

SECTION VI: RESULTS OF VEGETATION, WILDLIFE AND HABITAT CHARACTERIZATION

1. Summary of Vegetation Characterization

During DWR field work at the East Delta properties over 120 plant species were observed, representing 44 plant families (Appendix 1). A substantial number of species were common to most of the ponds. There was little difference in species richness between the nine ponds, as most ponds possessed between 50-60 different plant species.

At least 50 of the plants observed at the East Delta properties are species native to California. Of these native species, approximately half are wetland or riparian species, such as various species of *Juncus* (rush), *Salix* (willow) and *Scirpus* (bulrush). Of the approximately 70 nonnative plant species seen at the properties, most were upland species, including many species in the Poaceae (grass) family. This predominance of nonnative plants is typical of disturbed areas; many of these species tend to be weedy, opportunistic plants which flourish in recently disturbed environments when competition with other plants is low.

2. Plant Association Descriptions

The vegetation of the East Delta properties was described and mapped as plant associations (Appendix 2). Plant associations are assemblages of plant species found growing together in specific environmental conditions. The line between adjacent plant associations may be sharp, as between a regularly flooded wetland and an upland levee bank, or indistinct, as exemplified by the gradual change in the density of trees between a forest and a shrub field. One association may form mosaics within another, such as clumps of shrubs within a larger grassland. In the East Delta properties the plant associations are strongly associated with water; they vary with phenomena such as distance to the water table or frequency of flooding. Plant associations are dynamic; environmental conditions may change through natural causes (climate changes or succession where plants themselves change the microclimate) or through management practices.

The following plant associations were described using these parameters: the number of layers (trees, shrubs, herbs/graminoids), the species composition of each layer, the plant species diversity, the area covered, the moisture regime, and sensitive plant species which might occur there. Table 5 shows the number of acres of each plant association found at each of the East Delta properties.

Plant associations are named for the dominant species, with the common names listed first, then the scientific names, and then the symbols used for the mapping units.

Fremont's cottonwood-Willow (*Populus fremontii*-*Salix* spp.): POFR-SALIX

This plant association is multilayered with a tree layer of cottonwoods and willows and a shrub layer of cottonwood and willow saplings, sandbar willows and Himalayan blackberries. The herb layer consists of a variety of herbs and graminoids, such as hardstem bulrush, poison hemlock, field mustard, riggut brome, and geranium. This plant association is found in areas where the water table is near the surface, such as at pond edges, in toe drains and in excavations.

Table 5: Total area of each plant association in acres and hectares.

Plant Association	Dominant Species	Acres	Hectares
ATLE	Big saltbush	5.3	2.2
ATLE-BAPI	Big saltbush and Coyote bush	0.4	0.2
BAPI	Coyote bush	2.6	1.1
GRASS	Nonnative grasses	436.1	176.5
JUBA-DISP	Baltic rush-Saltgrass	74.0	30.0
JUBA-DISP/ GRASS	Baltic rush-Saltgrass/ nonnative grasslands	117.2	47.4
POFR-HERB	Fremont's cottonwood-Herb	16.0	6.5
POFR-SALIX	Fremont's cottonwood-Willow	45.2	18.3
RUDI	Blackberry	1.7	0.7
SALIX	Willow	36.7	14.8
SASE-RUDI	Sandbar willow-Blackberry	16.0	6.5
SCAC-TYPHA	Bulrush-Cattail	113.1	45.8

Fremont's cottonwood-Herb (*Populus fremontii*-Herb): POFR-HERB

This plant association is similar to Fremont's cottonwood-Willow, except that the shrub layer is absent. Species composing the herb layer include stinging nettle, poison hemlock, field mustard, Baltic rush, rigput brome, wild radish, and ox-tongue. This community appears to be in slightly drier areas such as depressions in uplands.

Willow (*Salix* spp.): SALIX

This plant association, similar to Fremont's cottonwood-Willow, is multilayered with willows (usually several different species) in the tree layer. The herb layer is composed of obligate or facultative wetland species such as broad-leaved and narrow-leaved cattail, curly dock, bur-reed, three-square, water smartweed, and nutsedge. This community occurs in depressions, pond edges, along the toe of levees, and in channels where there is a high water table or standing water.

Sandbar willow-Blackberry (*Salix sessilifolia*-*Rubus discolor*): SASE-RUDI

This plant association has a typically dense shrub layer composed of sandbar willow and Himalayan blackberry. Scattered cottonwood or dogwood may be present. If an herb layer is present, it usually consists of species such as curly dock, ox-tongue, field mustard, and poison hemlock. This plant association occurs in ditches and along channels where the water table is near the surface or where water flows at least occasionally.

Baltic Rush-Saltgrass (*Juncus balticus*-*Distichlis spicata*): JUBA-DISP

This plant association consists primarily of an herb layer, although scattered shrubs and trees may occur. The predominant species include Baltic rush, Mexican rush, salt grass, curly dock, yerba mansa, stinging nettle, alkali heath, rabbit's foot grass, and Bermuda grass. A large diversity of other species also occurs in this community. This plant association occurs where there is periodic flooding as shown by the presence of facultative wetland species and salt tolerant species.

Bulrush-Cattail (*Scirpus acutus*-*Typha* spp.): SCAC-TYPHA

This plant association is dominated by hardstem bulrush, narrow-leaved cattail, and broad-leaved cattail in an herb/graminoid layer. Diversity ranges from nearly a monoculture of hardstem bulrush to a very diverse community where mosaics of different species reflect changes in microtopography. Other species include three-square, bur-reed, rabbit's-foot grass, Bermuda grass, nutsedge, common rush, arrowhead, and other wetland species. This community may cover large areas in tidally flooded areas or it may be a narrow band fringing a pond. This plant association occurs where there is standing water or saturated soils. Sensitive plant species which may be found in this plant association include Mason's lilaeopsis, California hibiscus, Sanford's arrowhead, Delta tule pea, Delta mudwort, and Suisun aster.

Nonnative Grassland: GRASS

This plant association is dominated by nonnative grasses and herbs such as ripgut brome, Harding grass, and field mustard. Other species commonly found in this community include: stinging nettle, poison hemlock, Mexican rush, curly dock, milk thistle, and barley. This often very diverse community occurs on uplands and may cover large areas. Scattered trees and shrubs such as big saltbush and coyote bush may occur in this plant association. Heartscale is a sensitive plant species which may be found in alkaline areas of this plant association.

Big saltbush or Coyote bush (*Atriplex lentiformis* or *Baccharis pilularis*): ATLE or BAPI

Areas dominated by the shrubs big saltbush and coyote bush occasionally occur as mosaics within grasslands. In the study area big saltbush was planted (often in rows) to provide food and cover for upland game birds. The herb layer in this plant association is similar in species composition to that of the Nonnative Grassland association, with ripgut brome being the most common associate.

3. Wetlands Classification

Fourteen types of wetlands and uplands were mapped on the East Delta properties using the USFWS classification system (Appendix 3). The ponds themselves were placed into two categories depending on their size and depth. The East Delta lands surrounding the ponds were either uplands or palustrine types. Irrigated pasture lands were classified as palustrine farmed. Areas with trees taller than 20 feet (six meters) were mapped as palustrine forested temporarily or seasonally flooded. Areas with small trees and shrubs were classified as palustrine scrub-shrub temporarily flooded. The remaining wetlands fell into emergent vegetation types depending on how often they are flooded and whether they have been excavated.

Symbols for the wetland types mapped in the project area are described below. The first two types describe the ponds themselves and would be classified as "Waters of the United States" for the U.S. Army Corps of Engineers jurisdiction. A water body is classified as lacustrine if its total area exceeds 8 hectares (20 acres) or the deepest part exceeds 2 meters (6.6 feet); smaller or shallower water bodies are palustrine.

L1UBHx = Lacustrine, limnetic, unconsolidated bottom, permanently flooded,
excavated

PUBHx = Palustrine, unconsolidated bottom, permanently flooded, excavated

Areas mapped as the following types may or may not be jurisdictional wetlands; a wetland delineation would be required to determine if these areas have wetland hydrology, hydric soils, and hydrophytic vegetation.

Pf = Palustrine, farmed

PSSA = Palustrine, scrub-shrub, temporarily flooded

PEMA = Palustrine, emergent, temporarily flooded

PEMAx = Palustrine, emergent, temporarily flooded, excavated

PEMAh = Palustrine, emergent, temporarily flooded, diked or impounded

PEMC = Palustrine, emergent, seasonally flooded

PEMCx = Palustrine, emergent, seasonally flooded, excavated

PFOA = Palustrine, forested, temporarily flooded

PFOAx = Palustrine, forested, temporarily flooded excavated

PFOC = Palustrine, forested, seasonally flooded

Areas mapped as the following types are very likely to be wetlands which fulfill the three criteria for Corps jurisdiction.

PEMF = Palustrine, emergent, semipermanently flooded

PEMFx = Palustrine, emergent, semipermanently flooded, excavated

PEMT = Palustrine, emergent, semipermanent tidal

PEMV = Palustrine, emergent, permanent tidal

Areas mapped as the following type are not wetlands and are not under Corps jurisdiction, although small wetland areas may be included within this mapping unit.

U = Upland

4. Sensitive Plant Species and Rare Natural Communities

Sensitive Plant Species

The vegetation surveys identified potential habitat for seven sensitive plant species (Table 2). Six of these species, Suisun aster, Delta tule pea, Mason's lilaeopsis, Sanford's arrowhead, Delta mudwort, and California hibiscus, are associated with wetlands mapped as the Bulrush-Cattail plant association. Many of the levee banks bordering the East Delta properties and the adjacent canals are maintained by burning, herbicide spraying, and/or mowing, therefore, surveys were concentrated in unleveed areas where natural vegetation occurred. There were no previous

reported occurrences of Suisun aster, Delta tule pea, Mason's lilaeopsis, Delta mudwort or Sanford's arrowhead in the East Delta properties and no populations were located in the 1994 surveys. A 1988 NDDDB record of California hibiscus was reported for the wetland along the branch of White Slough which is adjacent to Pond 11. This population was not located during the 1994 field surveys.

Chenopod scrub and alkaline or saline grasslands are habitat for heartscale. There were no previous records for this species occurring in the East Delta properties and it was not found on the small amount of potential habitat within the Nonnative Grassland plant association in the study area.

No potential habitat was located for three of the sensitive plant species identified in the NDDDB. These include legenere, found in vernal pools; alkali milk-vetch, found in adobe clay grasslands and alkaline vernal pools; and caper-fruited tropidocarpum, found in grasslands in alkaline hills.

Rare Natural Communities

One type of rare natural community, the Coastal and Valley Freshwater Marsh, was identified at the East Delta properties. This community type is represented by the Bulrush-Cattail plant association in the project area. This community occurs in regularly flooded areas where the land is not separated from the slough by a levee. Three sites of this rare community are found in the project area. Two of the sites are adjacent to Upland Slough, 2.2 acres near Pond 7 and 64 acres near Pond 9. Thirty-five acres of freshwater marsh occur along Highline Canal near Pond 11.

The project area provides potential habitat for the Valley Oak Woodland community. Some of the areas mapped as Nonnative Grassland plant association have valley oak seedlings and saplings which could eventually grow to form a woodland.

Potential habitat was not found at the East Delta properties for three of the natural communities identified in the NDDDB. The Northern Hardpan Vernal Pool community requires soils with an underlying hardpan which are not present in the area. The Great Valley Valley Oak Riparian Forest community occurs above active river channels where occasional flooding provides a deposit of silt. The Great Valley Mixed Riparian Forest community requires regular flooding but occurs slightly above active river channels where erosion is not too severe. Levee building and other agricultural practices have removed the required hydrologic function which may have supported these two communities in the area in the past.

5. Wildlife Species

A wide variety of wildlife species was observed on the East Delta properties (see Appendix 4). These species can be subdivided into five major groups: crustaceans, amphibians, reptiles, birds, and mammals. Only two species of crustaceans and one of amphibian were seen, but eight reptilian species were noted on the project site as well as ten species of mammals. Birds were the group observed most frequently. Because the field observations were conducted primarily during the spring and summer months, the results are biased toward species composition and diversity at the properties during these times of the year. In particular, bird species composition will undergo significant changes between the summer and winter months. Also, certain other groups of species, such as fish and other aquatic organisms, burrowing organisms

and insects, are undoubtedly under-represented. Nocturnal animals are not well represented on the list, since all field observations were made during the day. (However, several owls were flushed from their day-time roosts.) Overall diversity at the properties will be greater than what is recorded in this report.

A total of 91 bird species was observed in the project area during 1994 field work. No wildlife observations were made at Pond 8. However, it is probable that the species composition of Pond 8 is similar to that of Pond 7. Only three species (green heron, rufous-sided towhee, and mourning dove) were found at all eight observed pond properties. However, nine species (red-winged blackbird, great blue heron, red-tailed hawk, northern harrier, yellow-rumped warbler, cliff swallow, song sparrow, black phoebe, and tree swallow) were found at seven of the eight observed areas. And another ten species (mallard, great egret, turkey vulture, belted kingfisher, American crow, white-tailed kite, common yellowthroat, double-crested cormorant, ring-necked pheasant, and American robin) were observed at six areas. Approximately 25% of the observed bird species were seen only at one pond; this is most likely a reflection of survey techniques, rather than evidence of unique habitat present at a particular pond site. The highest total number of bird species observed was at Pond 11. This apparent species richness was probably due to the variety of habitats at the pond, including riparian, upland, and tidal marshlands. A total of 107 bird species were observed in the White Slough Wildlife Area during Christmas Bird Counts in 1984 and 1986-1993. Ninety-six of these 107 were observed by DWR staff during 1994 field work.

Incidental field observations at the East Delta properties recorded a total of ten mammal species, although one of the species was not observed alive. No mammals were observed at Pond 5. This is probably not an accurate reflection of species richness; it is likely that most of the species observed occur at all nine pond areas but simply were not seen during field work.

A total of seven reptilian species was observed in the project area, as well as several unidentified snakes and turtles. The highest number of observed and identified reptile species was at Pond 7, although the numbers were fairly low in all areas. The number of reptiles observed during field work was highly dependent on weather conditions. Species were often observed early in the day while temperatures were still cool. Only one amphibian species was observed on the East Delta properties; this was the bullfrog, a species introduced to California from eastern North America.

Crayfish were observed at various locations in the project site. Although the species were not identified in the field, it is probable that two species are present in the East Delta properties. The first is the signal crayfish which is found in many of the Delta waterways, including the sloughs that lie along the west side of the project area. The second, the red swamp crayfish is found in standing or stagnant water, such as the ponds and some ditches near the ponds. Both are species that have been introduced to California.

There are also several species of fish in the East Delta ponds. While no surveys were undertaken during the 1994 field work to determine current species composition, it is probably similar to what was originally stocked in the ponds. In the late 1970's, large-mouth bass, channel catfish, and red-eared sunfish were stocked by CDFG in at least Ponds 7 and 8 (Jim Martin, pers. comm., 1994). Other ponds were probably also stocked, however records of stocking activities at the East Delta properties were not obtained. Since the original stocking, more species (such as

golden shiner, minnow, and other centrarchids) may also have been introduced by anglers using live bait. Also, carp were observed at Pond 10, and one fisherman encountered during field work reported catching black bass.

On June 6, 1994, while conducting field surveys at Pond 10, approximately 100 dead carp were observed floating in the pond. It is not known if carp are the only species of fish present in Pond 10; however, they were the only species affected by the fish kill. Live carp were also observed in the pond on the same day feeding on cottonwood seeds. Several years previously, another fish kill was noted at Pond 11. The cause of these fish kills is not known, but there are several possibilities. The most likely reason for the mortalities is an insufficient level of dissolved oxygen in the ponds, due to their shallow, stagnant nature and/or high biochemical oxygen demand. Another possible explanation is that contaminated ground water leached into the ponds from adjacent agricultural lands. As described in the section on land use (Section III, No. 3), the White Slough Water Pollution Control Plant spreads its treated effluent and sludge on the agricultural lands adjacent to Ponds 9-13. High nitrogen levels from the effluent and sludge, or high levels of agricultural chemicals leaching into the ponds could prove detrimental to resident fish populations.

6. Sensitive Wildlife Species

Of the thirty-four threatened, endangered and sensitive wildlife species whose ranges include the project site (Table 3), only fifteen were actually observed during DWR field surveys, although three additional species were observed during Christmas Bird Counts (short-eared owl, merlin, and prairie falcon). The species observed during DWR surveys are the western pond turtle, giant garter snake, Cooper's hawk, ferruginous hawk, sharp-shinned hawk, tricolored blackbird, Swainson's hawk, northern harrier, yellow warbler, white-tailed kite, common loon, greater sandhill crane, loggerhead shrike, California black rail, and double-crested cormorant. The results of surveys for the four species listed as threatened or endangered are described below.

Giant garter snake (*Thamnophis couchi gigas*)

Giant garter snakes have been observed at several locations in the project area since 1974. Most of the sightings have been concentrated at Pond 9, but field work in 1994 resulted in additional observations from Pond 7 and Pond 11, as well as a site halfway between Pond 6 and Pond 7.

All of the locations at which giant garter snakes were observed contained appropriate habitat: slow moving water in channels with mud banks and mud bottoms, plenty of cover, and accessibility to higher ground. Several other locations within the East Delta properties may also contain limited appropriate habitat, but it is more likely that any new sightings will be made in the sloughs and canals connecting the properties.

Swainson's hawks (*Buteo swainsoni*)

As with Estep's 1990 survey, no Swainson's nests were observed within the project area. However, several birds were observed foraging over ponds 6, 10, and 12. Swainson's hawks apparently rarely nest in the vicinity of the East Delta properties; this may be a result of inappropriate cropping patterns which cannot provide an adequate prey base for the birds (Estep,

pers. comm., 1994). However, several portions of the project area do contain trees that are mature enough to be suitable nesting sites. Future land use and cropping patterns in the vicinity of the ponds may affect whether Swainson's hawks ultimately nest in this area.

California black rail (*Laterallus jamaicensis coturniculus*)

Three listening stations were surveyed in the small tidal marsh west of Pond 7. Sora and Virginia rails were present in this wetland, but no black rails were detected. Three listening stations were surveyed in the tidal marsh west of Pond 9. Again, Virginia rail and sora were present, but no black rails were detected. Four listening stations were surveyed in the extensive tidal marsh west of Pond 11. There were no detections at the first listening station. Spontaneous vocalizations of three black rails were heard at station 11.2. One black rail responded to a taped call at station 11.3, and two black rails responded to taped calls at station 11.4. Virginia rails and sora were abundant in the Pond 11 tidal marsh. Black rails were also heard spontaneously calling from the emergent marsh west of Pond 11 during a July 5, 1994 vegetation survey. These observations are consistent with the historic records of California black rail detections at the White Slough Wildlife Area by Department of Fish and Game biologists.

Greater sandhill crane (*Grus canadensis tabida*)

Field surveys resulted in observations (visual and aural) of sandhill cranes in the vicinity of five of the eight surveyed ponds. The largest concentration of cranes observed within the East Delta properties was at Pond 6. A flock of approximately 2000 cranes (a mixture of greater sandhills and lesser sandhills, *G.c. canadensis*) was seen in the pasture adjacent to the pond. Another large flock (probably numbering in the hundreds) was visible in the fields directly south of Pond 6. Approximately 100 sandhill cranes were seen in the field immediately north of Pond 7. This flock also included both greater sandhill cranes and lesser sandhill cranes. A much smaller group of cranes was seen near Pond 10, west of White Slough. At Ponds 5 and 9 cranes were heard but not seen. Thus, it could not be determined if these were the threatened greater sandhill crane or the non-listed lesser sandhill crane. However, since other observed flocks consisted of both species, these probably did also.

7. Potential Sensitive Wildlife Species Habitat

Appropriate habitat exists within the project area for several sensitive wildlife species which were not observed during DWR field work. These species include the valley elderberry longhorn beetle, California red-legged frog, golden eagle, short-eared owl, burrowing owl, merlin, prairie falcon, bald eagle, purple martin, pallid bat, California mastiff bat, and Townsend's big-eared bat. The short-eared owl, merlin, and prairie falcon have been observed in the project area during Christmas Bird Counts. The California red-legged frog is the most unlikely of the species listed above to occur in the project area because the frog appears to have been extirpated from the Central Valley (Stebbins 1985). Vegetation surveys did not locate any elderberry bushes on the East Delta properties (though one was seen within one mile of the project site), therefore there is currently no habitat for the valley elderberry longhorn beetle. The existence of potential habitat

for sensitive species at the East Delta properties is significant because it indicates that sensitive species may use these areas in the future. Additional ecological surveys would be required if projects or a change in land use were planned.

8. Environmentally Sensitive Areas

Environmentally sensitive areas were identified to facilitate management decisions at the East Delta properties. Several criteria were used to determine environmental sensitivity; these criteria often occur together in the same area:

- 1) Presence of sensitive species.
- 2) Presence of potential habitat for sensitive species.
- 3) Presence of a rare natural community.
- 4) Presence of wetlands.

Sites which are environmentally sensitive due to the presence, during 1994 surveys, of species listed as threatened or endangered are shown on Figure 3. Management actions in these areas will require additional environmental review. The sites include:

- * The Bulrush-Cattail plant associations at Ponds 7, 9, and 11.
- * The irrigated pasture (a Baltic Rush-Saltgrass/Grass plant association) at Pond 6.
- * The grassland at Pond 10.

The following sites at the East Delta properties are environmentally sensitive for one or more of the above reasons and are shown on Figure 4.

- * The Bulrush-Cattail plant association at Ponds 6, 7, 9, and 11 is a type of rare Freshwater Emergent Marsh which provide potential habitat for several sensitive plants, giant garter snakes and black rails.
- * The Cottonwood-Willow and Cottonwood-Herb plant associations at Ponds 5, 6, 7, 8, 9, 10, 12, and 13 are potential habitat for Swainson's hawks and other sensitive birds because they provide large trees for nesting sites.
- * The Baltic rush-Saltgrass plant associations at Ponds 6, 7, and 9 may be classified as jurisdictional wetlands.
- * A portion of the Nonnative grassland plant association at Pond 5 has the potential to become a Valley Oak Woodland community.
- * The irrigated pasture at Pond 6 and the grassland at Pond 10 are habitat for sandhill cranes.

Figure 3. Areas where threatened or endangered species were found in 1994. These maps are intended for general land use planning purposes, not for site specific environmental impact analysis.

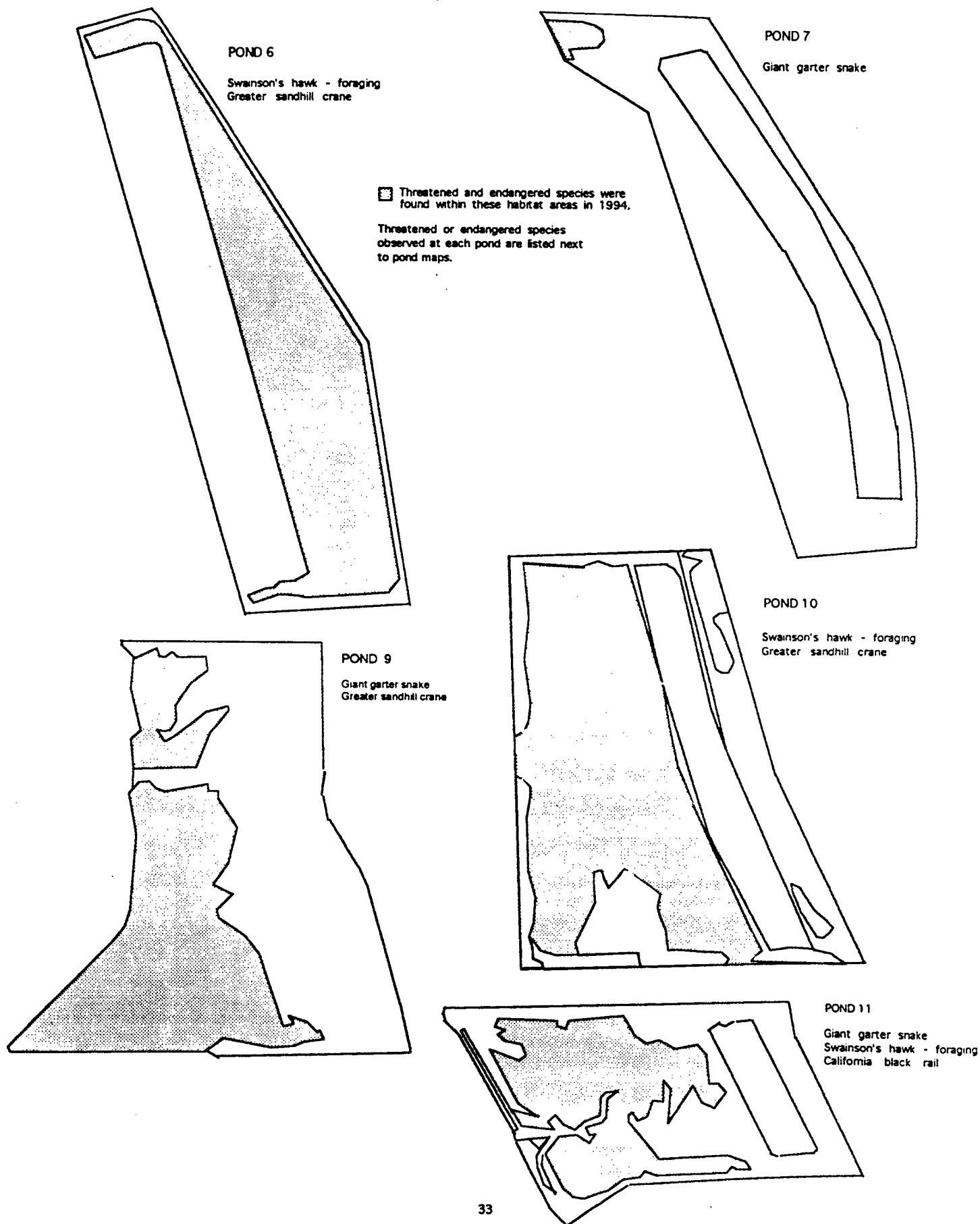


Figure 4. Environmentally sensitive areas in the East Delta Land Management properties (Ponds 5-8). These maps are intended for general land use planning purposes, not for site specific environmental impact analysis.



POND 5

Potential wetlands:
Cottonwood-Willow
Cottonwood-Herb

Potential rare plant
community:
Valley Oak saplings
in grassland

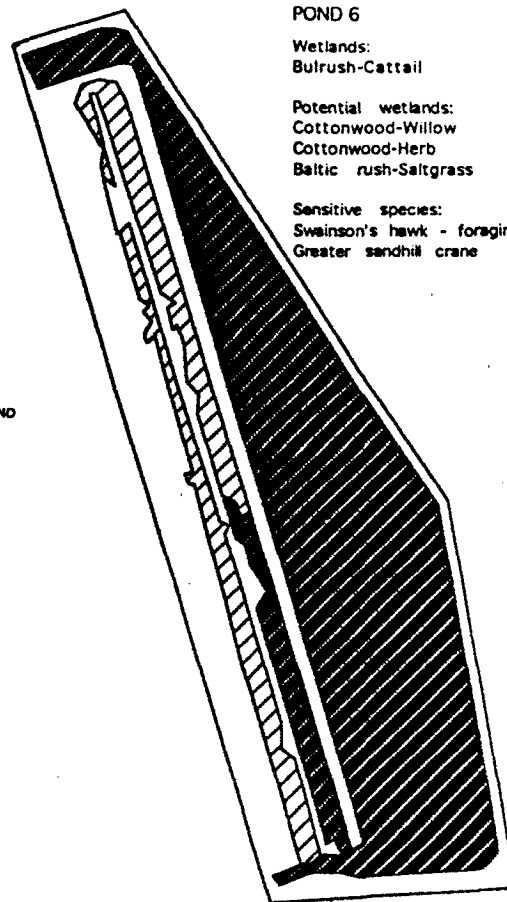


SENSITIVITY DUE TO
POTENTIAL NESTING TREES
AND/OR POTENTIAL WETLANDS



SENSITIVITY DUE TO
SENSITIVE SPECIES HABITAT, WETLAND
AND/OR RARE PLANT COMMUNITY

Sensitive plant associations
and wildlife present at each
pond are listed next to pond
maps.

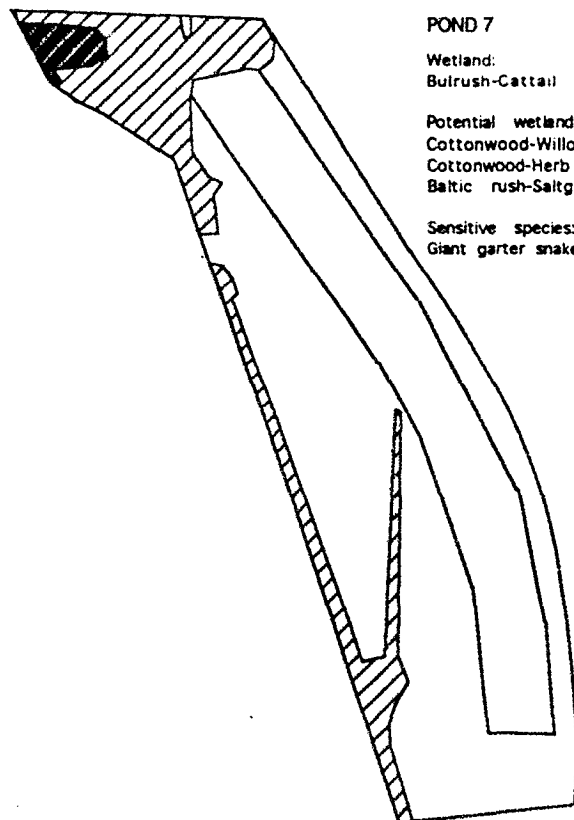


POND 6

Wetlands:
Bulrush-Cattail

Potential wetlands:
Cottonwood-Willow
Cottonwood-Herb
Baltic rush-Saltgrass

Sensitive species:
Swinson's hawk - foraging
Greater sandhill crane

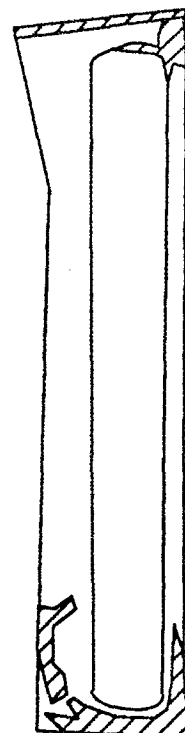


POND 7

Wetland:
Bulrush-Cattail

Potential wetlands:
Cottonwood-Willow
Cottonwood-Herb
Baltic rush-Saltgrass

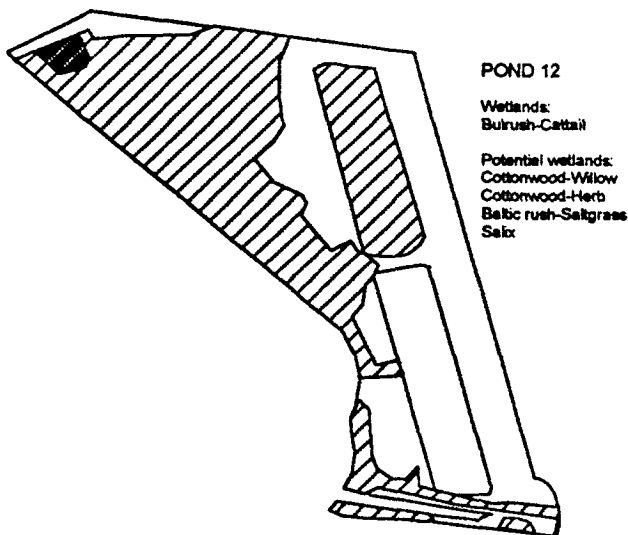
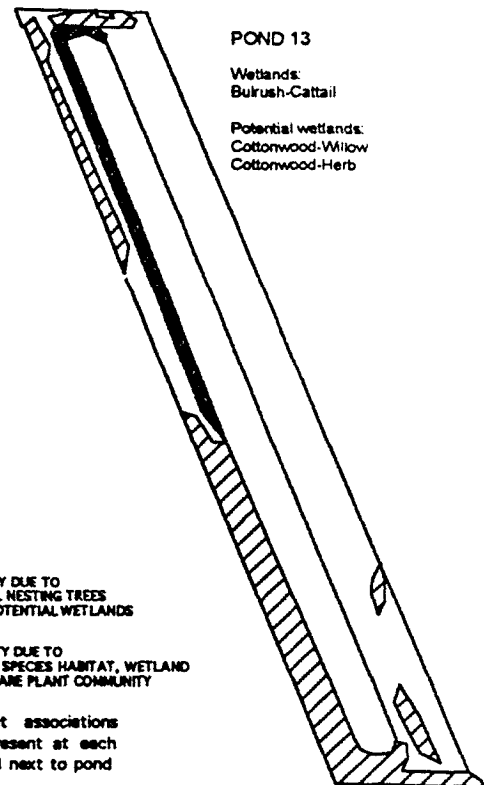
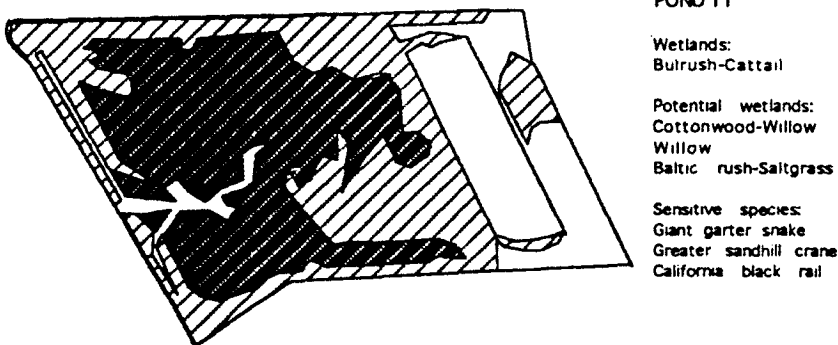
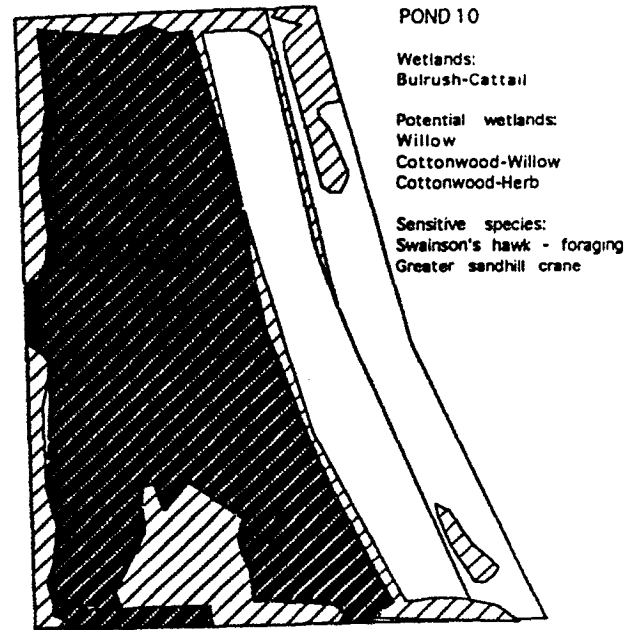
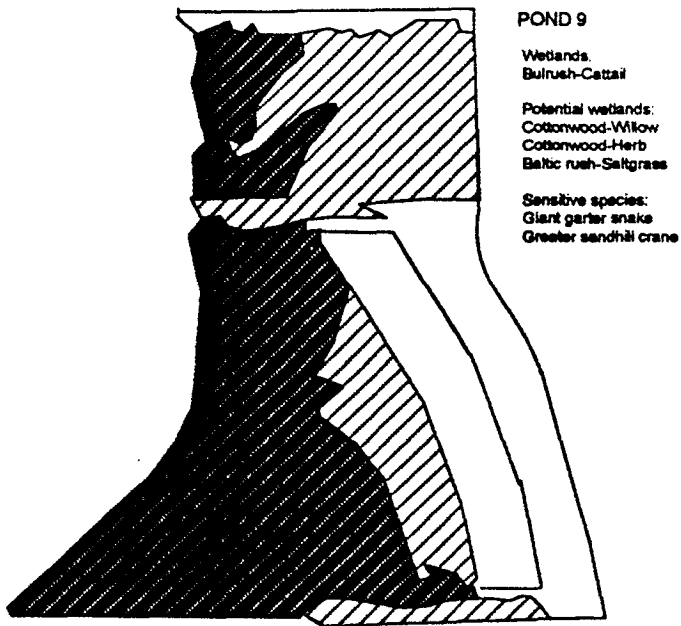
Sensitive species:
Giant garter snake





POND 8

Potential wetlands:
Cottonwood-Willow
Cottonwood-Herb

Figure 4 (continued). Environmentally sensitive areas in the East Delta Land Management properties (Ponds 9-13). These maps are intended general land use planning purposes, not for site specific environmental impact analysis.



 SENSITIVITY DUE TO
POTENTIAL NESTING TREES
AND/OR POTENTIAL WETLANDS
 SENSITIVITY DUE TO
SENSITIVE SPECIES HABITAT, WETLAND
AND/OR RARE PLANT COMMUNITY

Sensitive plant associations
and wildlife present at each
pond are listed next to pond
maps.

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APPENDIX 1

PLANT SPECIES OBSERVED AT THE EAST DELTA PROPERTIES

Nomenclature according to the Jepson Manual (1993)

<u>Family</u>	<u>Scientific name</u>	<u>Common name</u>
Alismataceae	<i>Sagittaria latifolia</i>	Arrowhead
Anacardiaceae	<i>Pistacia atlantica</i>	Pistachio
	<i>Toxicodendron diversiloba</i>	Western poison oak
Apiaceae	<i>Conium maculatum</i>	Poison hemlock
	<i>Foeniculum vulgare</i>	Fennel
	<i>Hydrocotyle ranunculoides</i>	Pennywort
Asclepiadaceae	<i>Asclepias fascicularis</i>	Narrow-leaf milkweed
	<i>Asclepias speciosa</i>	Showy milkweed
Asteraceae	<i>Artemisia douglasiana</i>	Mugwort
	<i>Baccharis douglasii</i>	Marsh baccharis
	<i>Baccharis pilularis</i>	Coyote brush
	<i>Centaurea solstitialis</i>	Yellow star thistle
	<i>Cirsium vulgare</i>	Bull thistle
	<i>Gnaphalium</i> spp.	Everlasting
	<i>Grindelia</i> spp.	Gumplant
	<i>Helenium puberulum</i>	Sneezeweed
	<i>Hemizonia pungens</i> ssp. <i>pungens</i>	Tarweed
	<i>Lactuca serriola</i>	Prickly lettuce
	<i>Picris echoides</i>	Ox tongue
	<i>Silybum marianum</i>	Milk thistle
	<i>Solidago</i> spp.	Goldenrod
	<i>Sonchus asper</i> ssp. <i>asper</i>	Prickly sow thistle
	<i>Sonchus oleraceous</i>	Common sow thistle
	<i>Tragopogon</i> spp.	Goat's beard
	<i>Xanthium strumarium</i>	Cocklebur
Azollaceae	<i>Azolla</i> spp.	Mosquito fern
Boraginaceae	<i>Amsinckia</i> spp.	Fiddleneck
	<i>Heliotropium curassavicum</i>	Heliotrope

<u>Family</u>	<u>Scientific name</u>	<u>Common name</u>
Brassicaceae	<i>Brassica rapa</i> <i>Capsella bursa-pastoris</i> <i>Lepidium latifolia</i>	Field mustard Shepherd's purse Pepper grass
Brassicaceae	<i>Raphanus raphanistrum</i> <i>Rorripa palustris</i>	Wild radish Yellow cress
Chenopodiaceae	<i>Atriplex lentiformis</i> <i>Atriplex patula</i> <i>Chenopodium album</i> <i>Chenopodium ambrosioides</i>	Big saltbrush Fat hen Lamb's quarters Mexican tea
Convolvulaceae	<i>Convolvulus arvensis</i> <i>Cressa truxillensis</i>	Morning glory Alkali weed
Cornaceae	<i>Cornus sericea</i> ssp. <i>sericea</i>	American dogwood
Cyperaceae	<i>Carex</i> spp. <i>Carex praegracilis</i> <i>Cyperus eragrostis</i> <i>Cyperus niger</i> <i>Eleocharis macrostachya</i> <i>Scirpus acutus</i> <i>Scirpus americanus</i> <i>Scirpus robustus</i>	Sedge Nutsedge Black nutsedge Spikerush Hardstem bulrush Three-square Alkali bulrush
Fabaceae	<i>Lotus corniculatus</i> <i>Melilotus alba</i> <i>Melilotus officianale</i> <i>Vicia</i> spp.	Birdfoot trefoil White sweetclover Yellow sweetclover Vetch
Fagaceae	<i>Quercus lobata</i>	Valley oak
Frankeniaceae	<i>Frankenia salina</i>	Alkali heath
Geraniaceae	<i>Erodium cicutarium</i> <i>Geranium dissectum</i>	Filaree Geranium
Haloragaceae	<i>Myriophyllum</i> spp.	Water-milfoil
Hypericaceae	<i>Hypericum perforatum</i>	St. John's wort

<u>Family</u>	<u>Scientific name</u>	<u>Common name</u>
Juglandaceae	<i>Juglans californica</i>	California black walnut
Juncaceae	<i>Juncus balticus</i> <i>Juncus effusus</i> <i>Juncus mexicanus</i> <i>Juncus xiphioides</i>	Baltic rush Rush Mexican rush Rush
Lamiaceae	<i>Lycopus americanus</i> <i>Marrubium vulgare</i>	Bugleweed Horehound
Lemnaceae	<i>Lemna</i> spp.	Duckweed
Liliaceae	<i>Asparagus officianale</i>	Asparagus
Lythraceae	<i>Lythrum salicaria</i>	Purple loosestrife
Malvaceae	<i>Malva</i> spp. <i>Malva neglecta</i>	Mallow Common mallow
Onagraceae	<i>Epilobium ciliatum</i> <i>Ludwigia hexapetala</i>	Willow herb Water primrose
Plantaginaceae	<i>Plantago lanceolata</i> <i>Plantago major</i>	English plantain Common plantain
Poaceae	<i>Alopecurus myosuroides</i> <i>Arundo donax</i> <i>Avena barbata</i> <i>Avena fatua</i> <i>Bromus diandrus</i> <i>Bromus hordaceus</i> <i>Cynodon dactylon</i> <i>Distichlis spicata</i> <i>Elytrigia pontica</i> ssp. <i>pontica</i> <i>Elymus glaucus</i> <i>Festuca arundinacea</i> <i>Hordeum marinum</i> ssp. <i>gussoneanum</i> <i>Hordeum murinum</i> ssp. <i>glaucum</i> <i>Lolium multiflorum</i> <i>Paspalum dilatatum</i> <i>Phalaris aquatica</i>	Foxtail Giant reed Slender wild oat Wild oat Ripgut brome Soft chess Bermuda grass Salt grass Tall wheatgrass Blue wildrye Tall fescue Mediterranean barley Barley Italian rye grass Dallis grass Harding grass

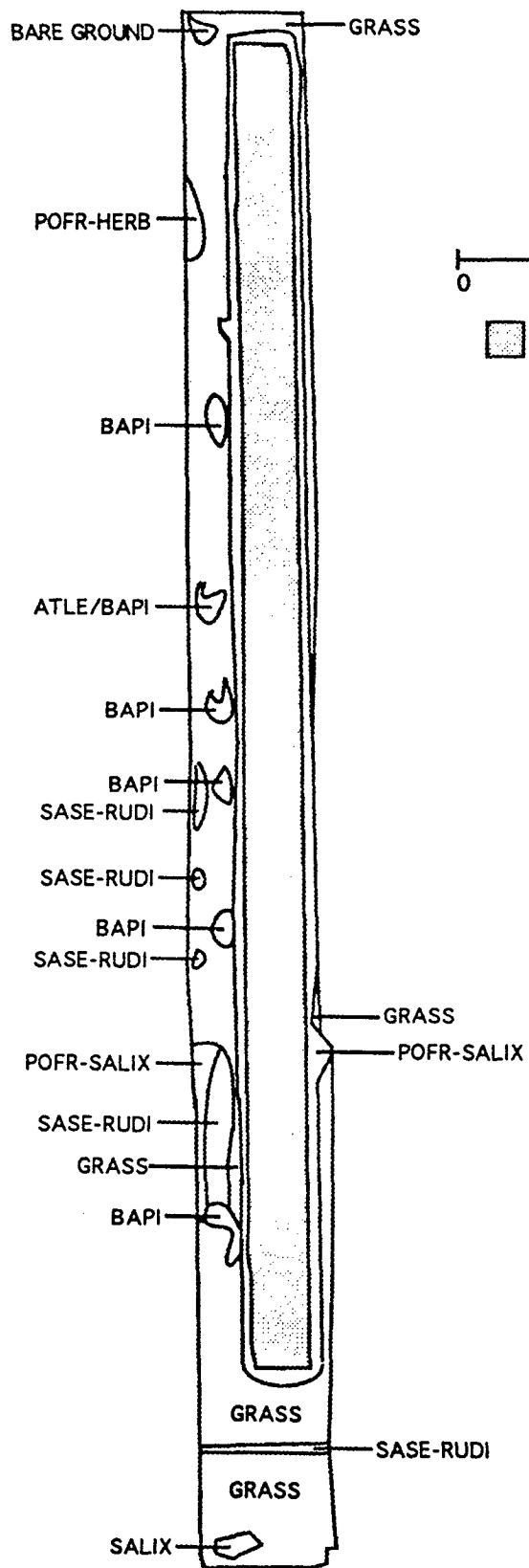
<u>Family</u>	<u>Scientific name</u>	<u>Common name</u>
Poaceae (cont)	<i>Phragmites australis</i>	Common reed
	<i>Poa annua</i>	Annual blue grass
	<i>Polypogon monspeliensis</i>	Rabbit's foot grass
	<i>Sorghum halepense</i>	Johnsongrass
Polygonaceae	<i>Polygonum amphibium</i> var. <i>emersum</i>	Water smartweed
	<i>Polygonum punctatum</i>	Knotweed
	<i>Polygonum</i> spp.	
	<i>Rumex conglomeratus</i>	Dock
	<i>Rumex crispus</i>	Curly dock
	<i>Rumex salicilifolius</i> var. <i>salicilifolius</i>	Willow dock
Pontederiaceae	<i>Eichornia crassipes</i>	Water hyacinth
Potamogetonaceae	<i>Potamogeton pectinatus</i>	Fennel-leaf pondweed
	<i>Sparganium eurycarpum</i> ssp. <i>eurycarpum</i>	Bur-reed
Primulaceae	<i>Anagallis arvensis</i>	Scarlet pimpernil
Ranunculaceae	<i>Ranunculus muricatus</i>	Buttercup
Rosaceae	<i>Prunus cerasifera</i>	Cherry plum
	<i>Rubus discolor</i>	Himalayan blackberry
Rubiaceae	<i>Galium aparine</i>	Bedstraw
Salicaceae	<i>Populus fremontii</i>	Fremont's cottonwood
	<i>Salix gooddingii</i>	Goodding's black willow
	<i>Salix lasiolepis</i>	Arroyo willow
	<i>Salix lucida</i>	Shining willow
	<i>Salix sessilifolia</i>	Sandbar willow
Saururaceae	<i>Anemopsis californica</i>	Yerba mansa
Scrophulariaceae	<i>Mimulus guttatus</i>	Monkeyflower
	<i>Veronica anagallis-aquatica</i>	Water speedwell
Solanaceae	<i>Solanum</i> spp.	Nightshade
Tamaricaceae	<i>Tamarix parviflora</i>	Tamarisk

<u>Family</u>	<u>Scientific name</u>	<u>Common name</u>
Typhaceae	<i>Typha latifolia</i> <i>Typha angustifolia</i>	Broad-leaved cattail Narrow-leaved cattail
Urticaceae	<i>Urtica dioica</i> ssp. <i>holosericea</i>	Stinging nettle
Verbenaceae	<i>Phyla nodiflora</i> var. <i>nodiflora</i> <i>Verbena hastata</i>	Lippia Blue vervain
Vitaceae	<i>Vitis californica</i>	California wild grape

APPENDIX 2
PLANT ASSOCIATION MAPS

LEGEND:

POFR-HERB:	Cottonwood-Herb
POFR-SALIX:	Cottonwood-Willow
SALIX:	Willow
SASE-RUDI:	Sandbar willow-Blackberry
RUDI:	Blackberry
ATLE:	Big Saltbush
BAPI:	Coyote brush
SCAC-TYPHA:	Hardstem bulrush-cattail
JUBA-DISP:	Baltic rush-saltgrass
GRASS:	Nonnative grasses
-----	Tidally influenced



POND 5

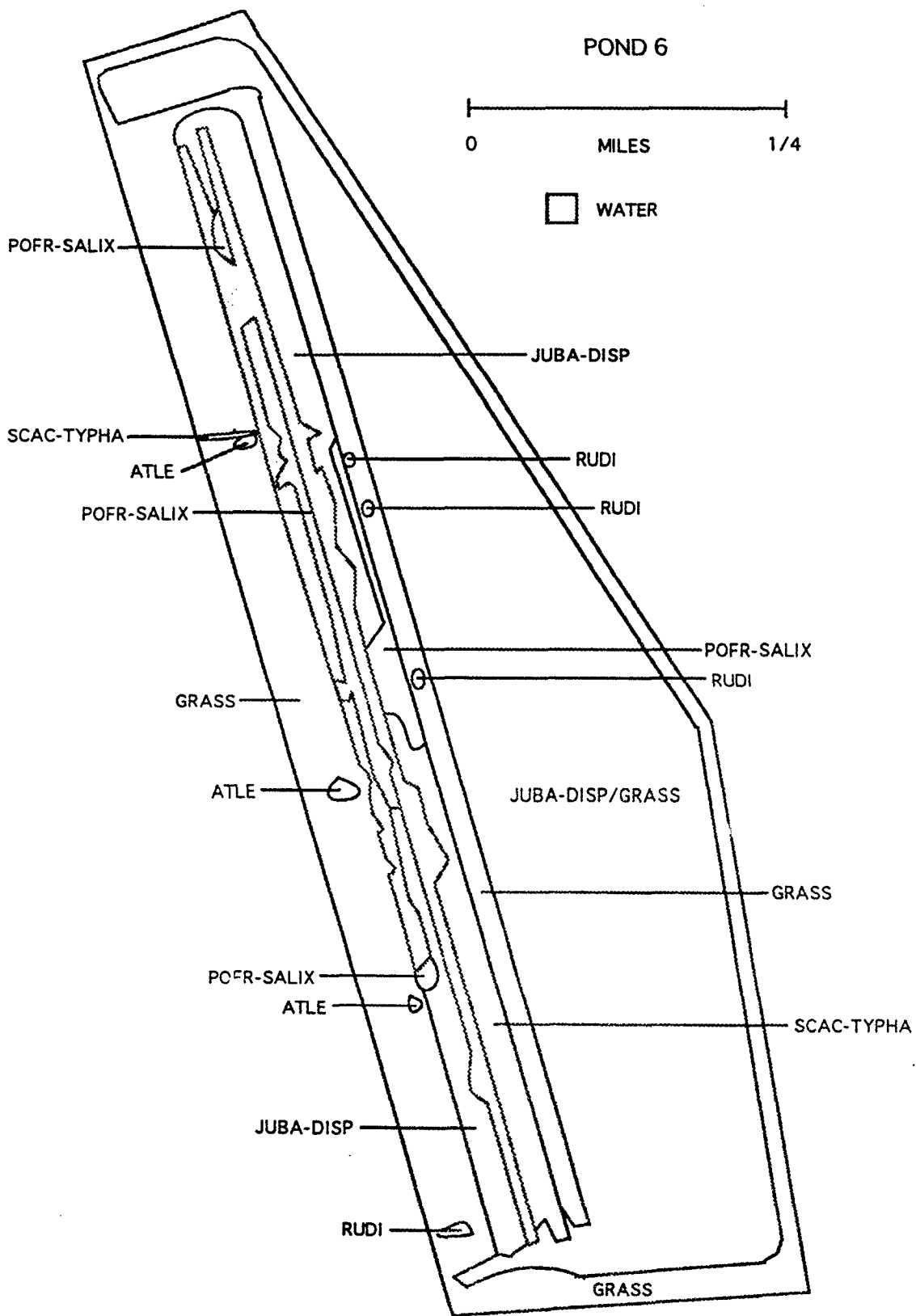
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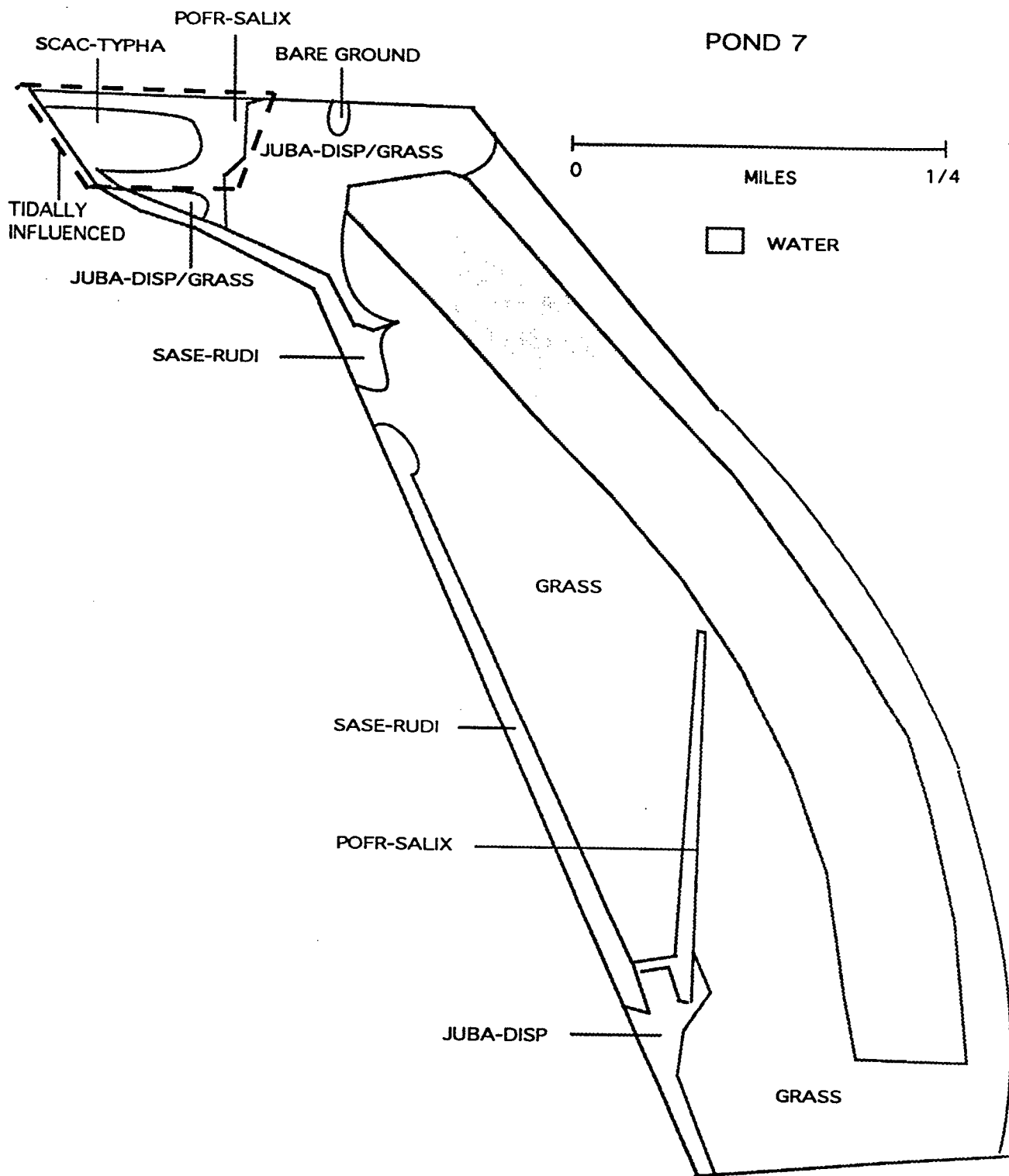
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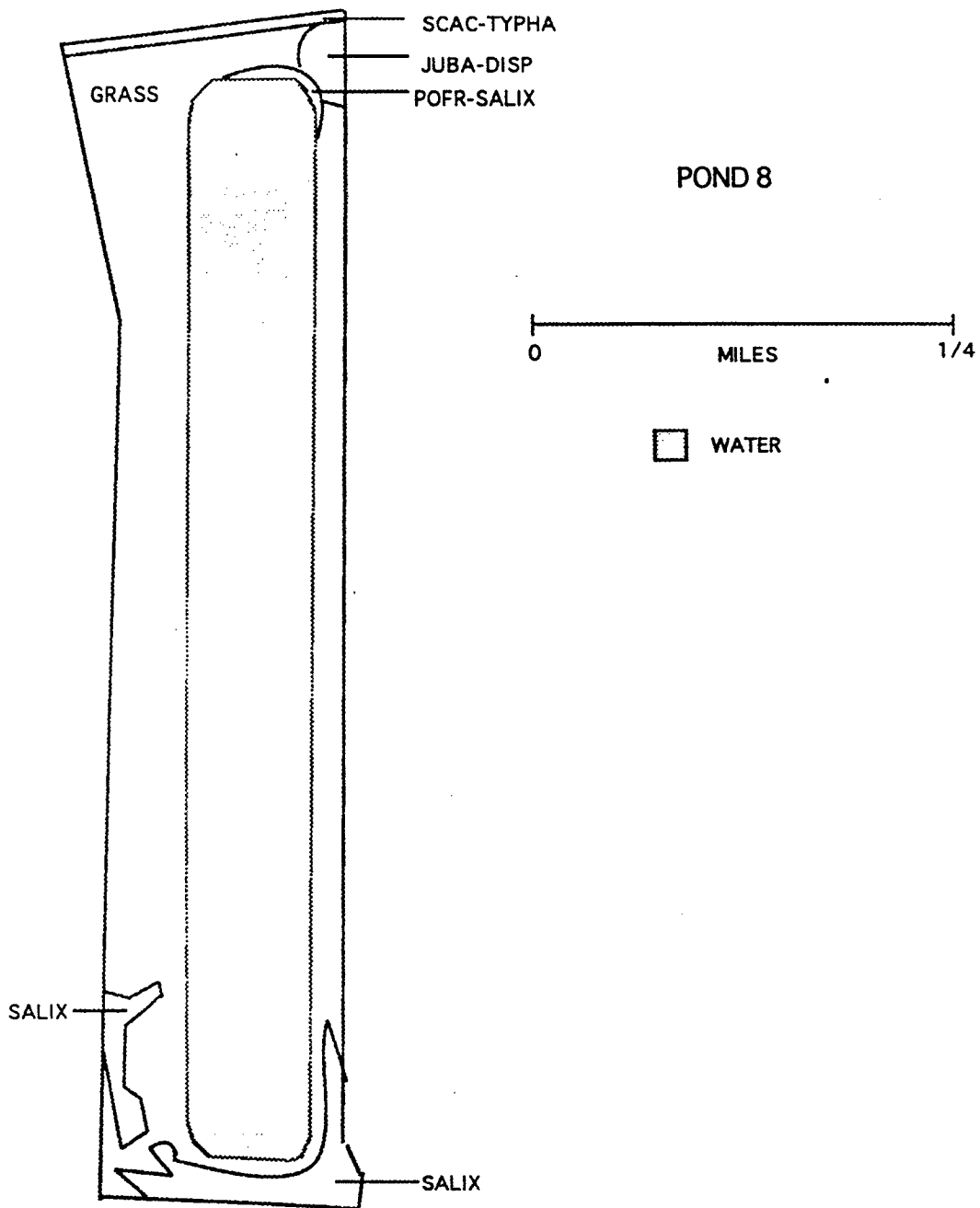
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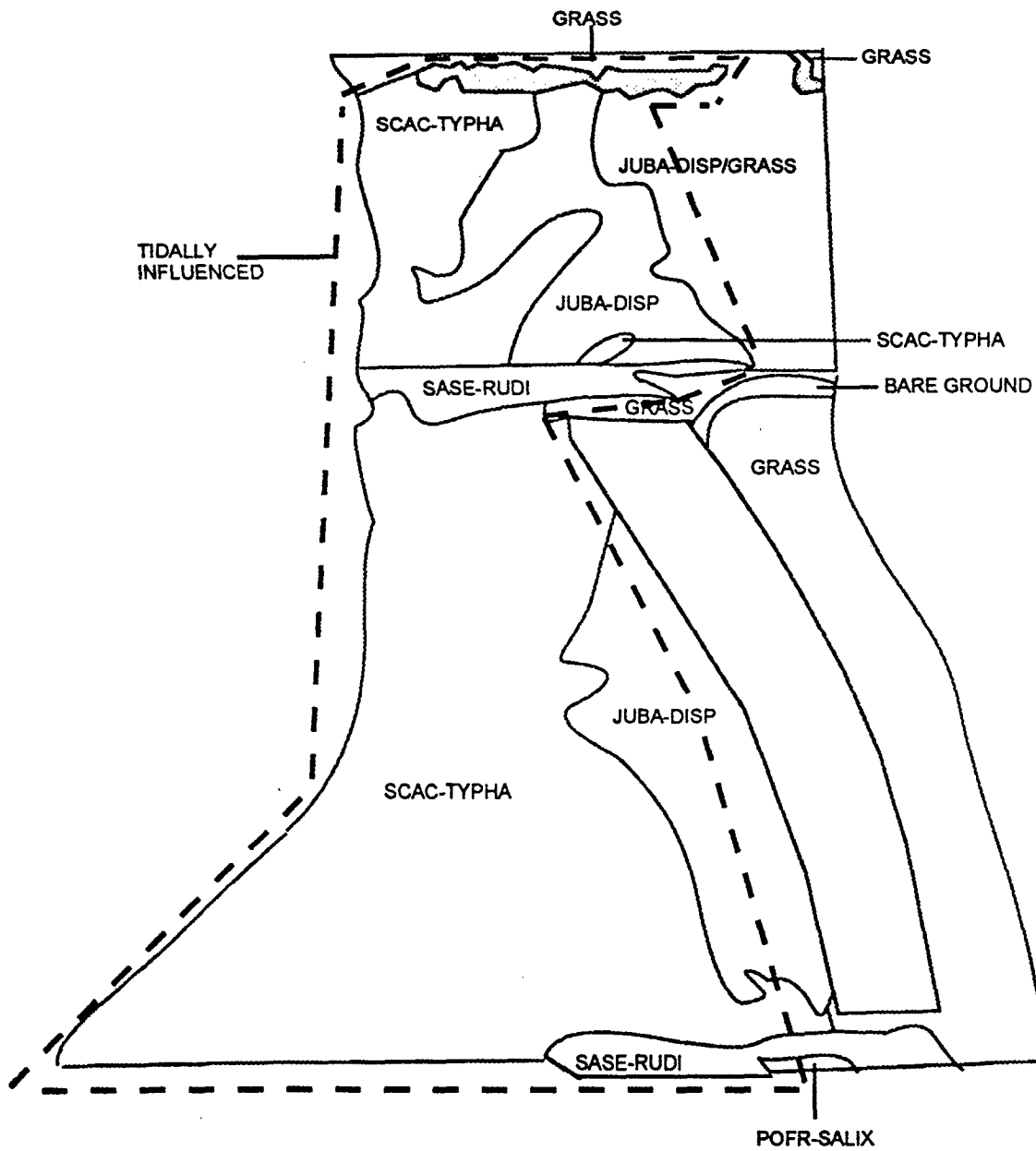




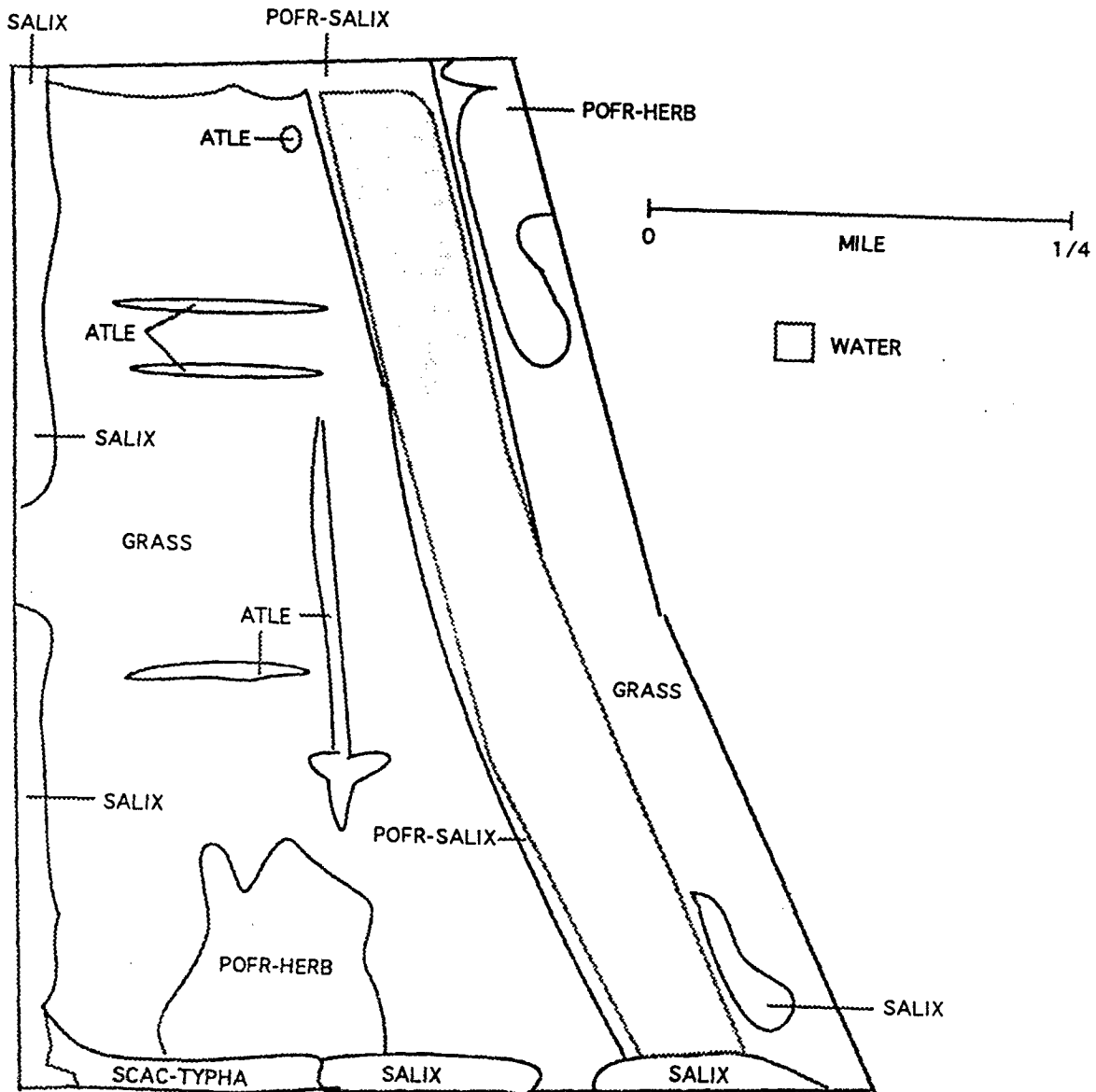
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WATER



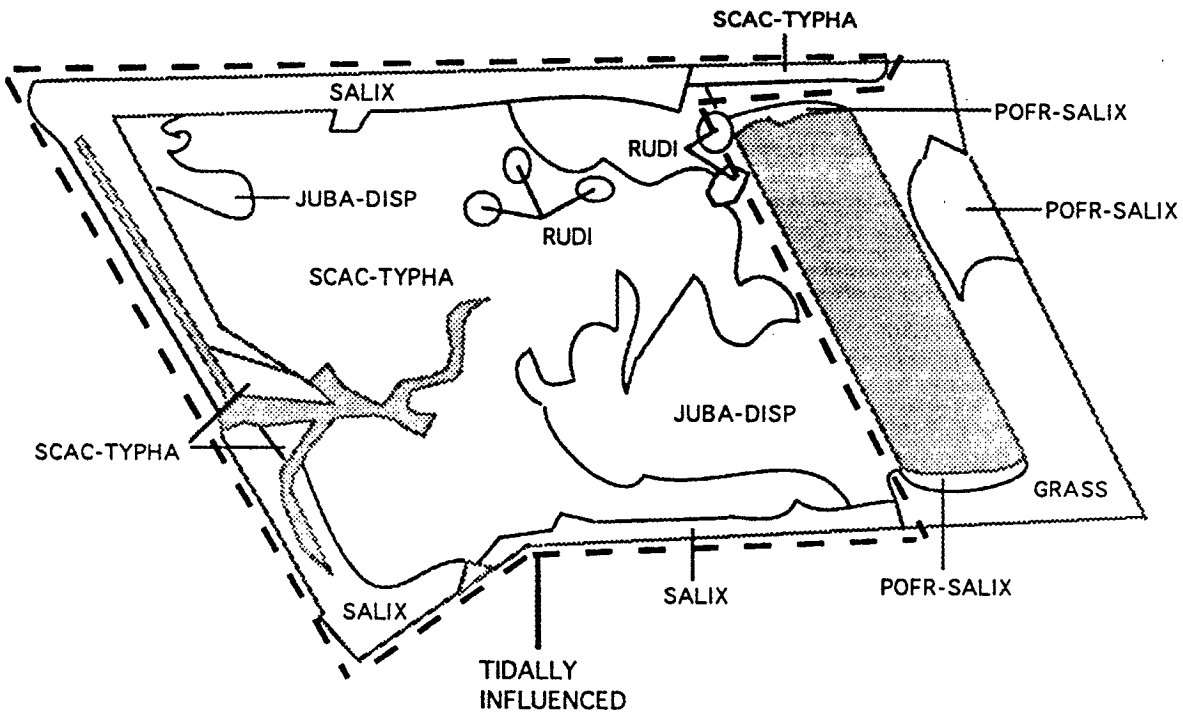
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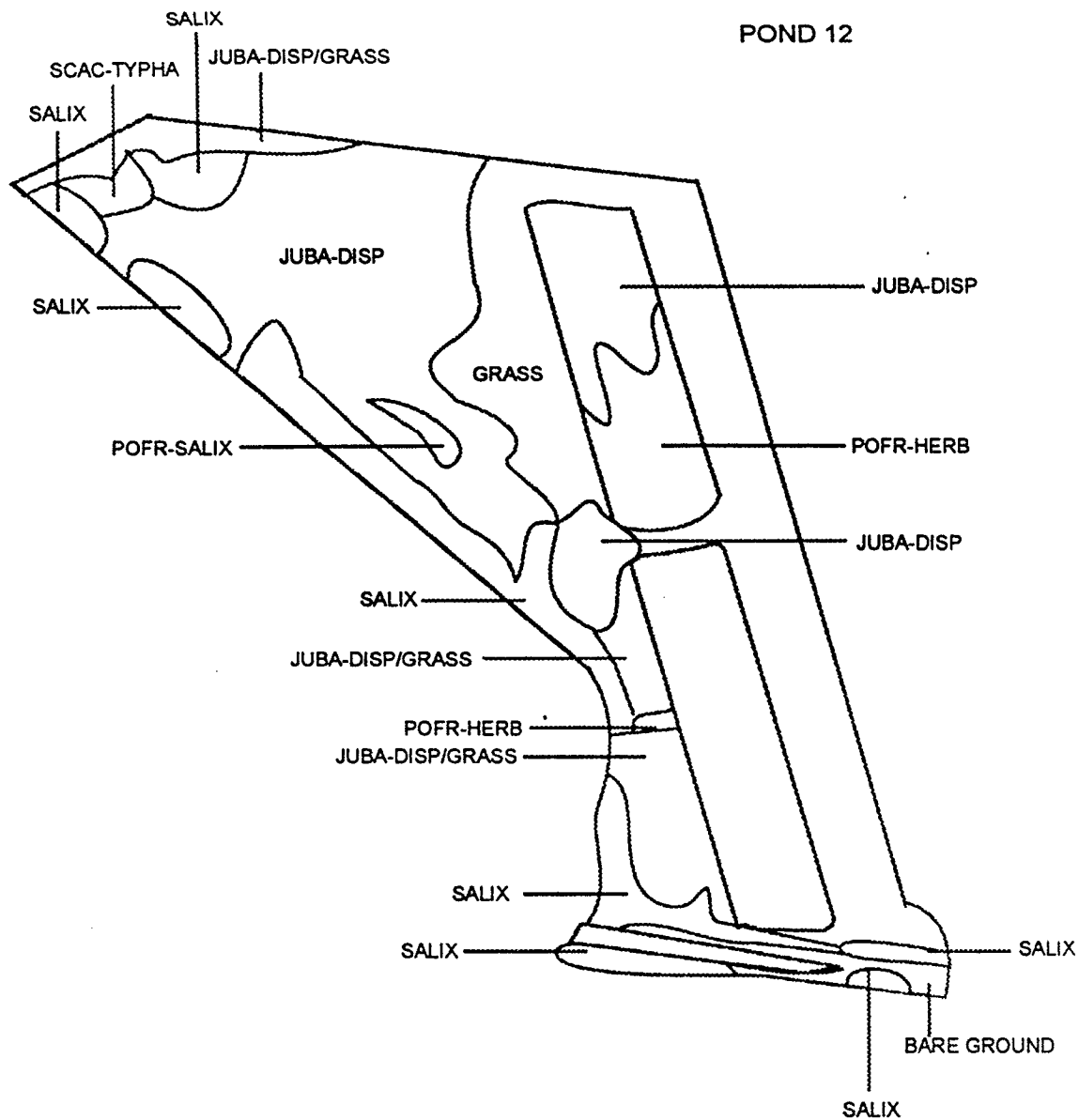


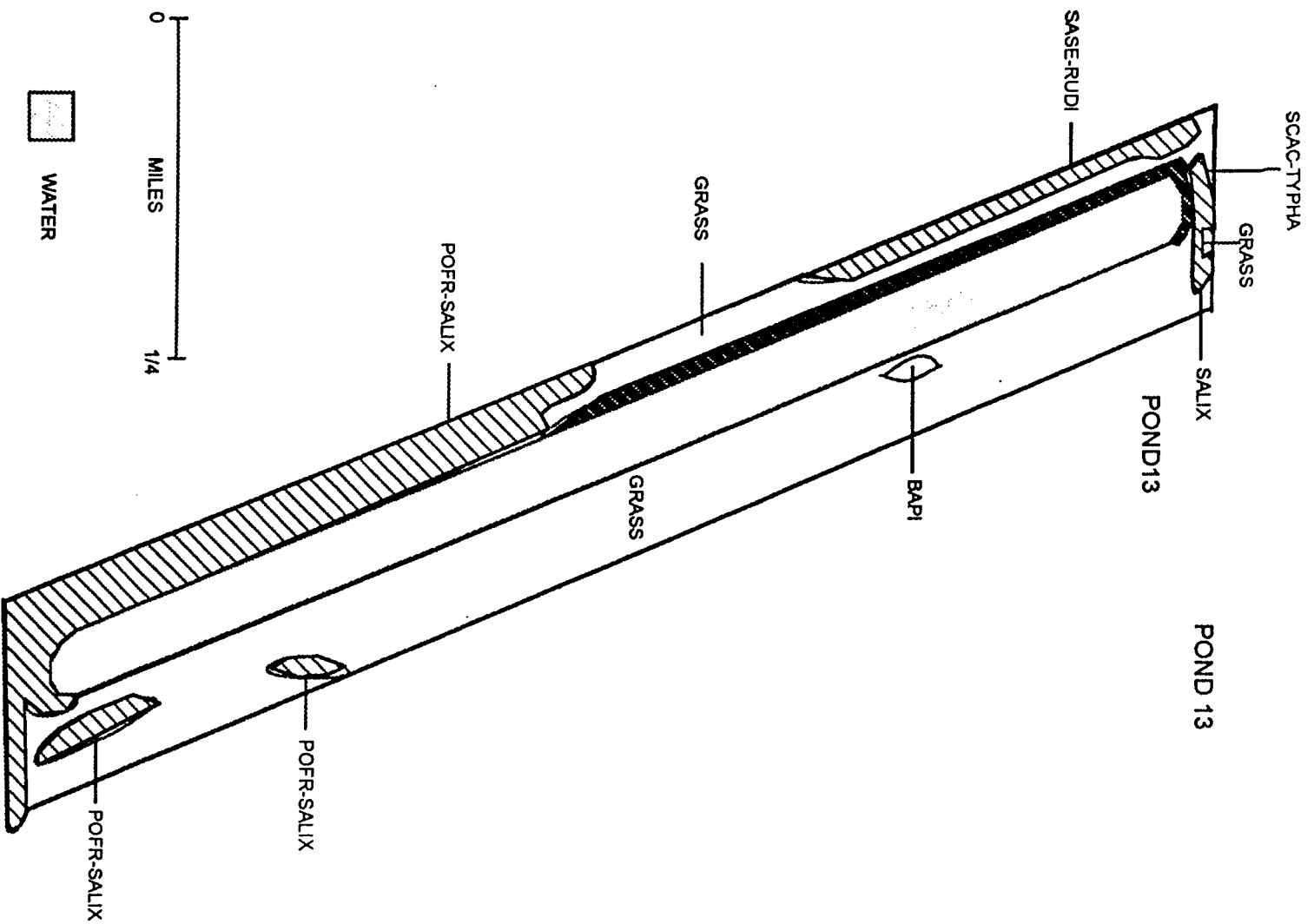
POND 11

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WATER







APPENDIX 3

WETLAND CLASSIFICATION MAPS

LEGEND:

L1UBHx = Lacustrine, limnetic, unconsolidated bottom, permanently flooded, excavated
PUBHx = Palustrine, unconsolidated bottom, permanently flooded, excavated

Pf = Palustrine, farmed

PSSA = Palustrine, scrub-shrub, temporarily flooded

PEMA = Palustrine, emergent, temporarily flooded

PEMAx = Palustrine, emergent, temporarily flooded, excavated

PEMC = Palustrine, emergent, seasonally flooded

PEMCx = Palustrine, emergent, seasonally flooded, excavated

PFOA = Palustrine, forested, temporarily flooded

PFOAx = Palustrine, forested, temporarily flooded excavated

PFOC = Palustrine, forested, seasonally flooded

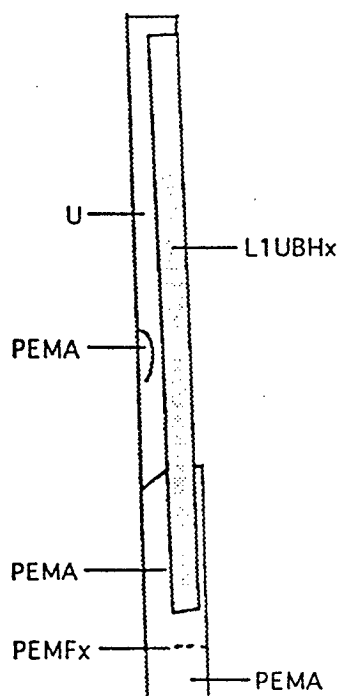
PEMF = Palustrine, emergent, semipermanently flooded

PEMFx = Palustrine, emergent, semipermanently flooded, excavated

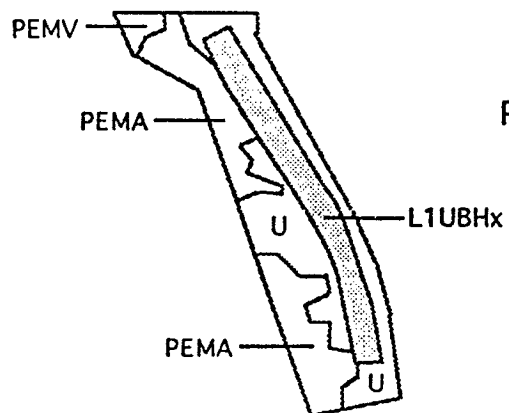
PEMT = Palustrine, emergent, semipermanently flooded, tidal

PEMV = Palustrine, emergent, permanent tidal

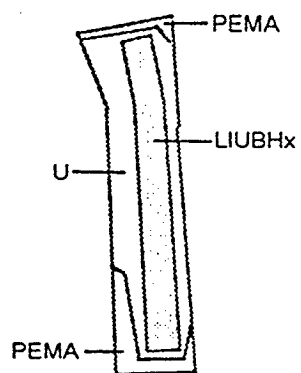
U = Upland



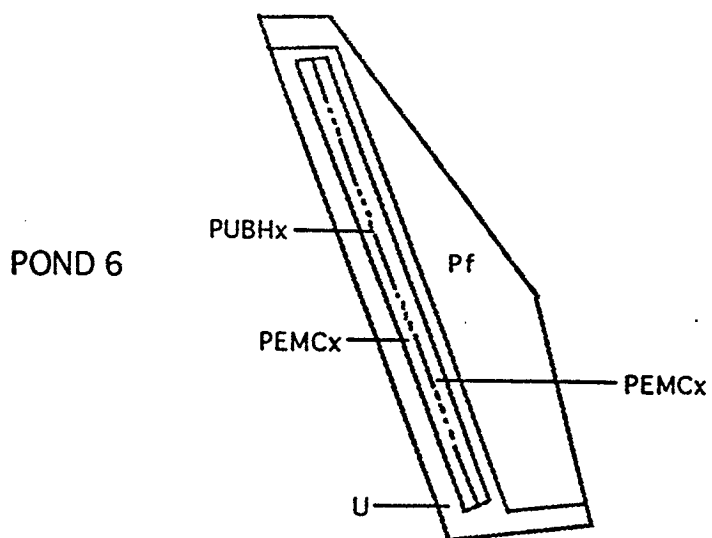
POND 5



POND 7



POND 8



POND 6

APPENDIX 4

CRUSTACEAN, AMPHIBIAN AND REPTILIAN SPECIES OBSERVED AT THE EAST DELTA PROPERTIES

<u>Common Name</u>	<u>Scientific Name</u>	<u>Locations Observed</u>
CRUSTACEANS:		
Signal crayfish	<i>Pacifastacus leniusculus</i>	7,9,10,12,13
Red swamp crayfish	<i>Procambarus clarkii</i>	7,9,10,12,13
AMPHIBIANS:		
Bullfrog	<i>Rana catesbeiana</i>	6,7,9,10,11,12
REPTILES:		
Snake (unidentified)		5,6
Turtle (unidentified)		7,9,10,11,12,13
Western pond turtle	<i>Clemmys marmorata</i>	7,10,11,13
Racer	<i>Coluber constrictor</i>	7,8,10
Skink	<i>Eumeces spp.</i>	13
Common king snake	<i>Lampropeltis getulus</i>	7
Gopher snake	<i>Pituophis melanoleucus</i>	7,9,10,12
Western fence lizard	<i>Sceloporus occidentalis</i>	7,9,10,11,13
Garter snake	<i>Thamnophis spp.</i>	7
Giant garter snake	<i>Thamnophis couchi gigas</i>	7,9,11

APPENDIX 4 (continued)

MAMMALIAN SPECIES OBSERVED AT THE EAST DELTA PROPERTIES

<u>Common Name</u>	<u>Scientific Name</u>	<u>Locations Observed</u>
Coyote	<i>Canis latrans</i>	7
Beaver	<i>Castor canadensis</i>	6,7,9,10,11,12,13
Domestic cat	<i>Felis domesticus</i>	9
Blacktail jackrabbit	<i>Lepus californicus</i>	10,13
Pacific river otter	<i>Lutra canadensis pacificus</i>	9
Striped skunk (carcass)	<i>Mephitis mephitis</i>	6
Mink	<i>Mustela vison</i>	9
Muskrat	<i>Ondatra zibethica</i>	6,7,10
California ground squirrel	<i>Spermophilus beecheyi</i>	10
Rabbit	<i>Sylvilagus spp.</i>	6,10,11,13

APPENDIX 4 (continued)

AVIAN SPECIES OBSERVED IN THE EAST DELTA PROPERTIES

* Indicates that species was observed in the White Slough Wildlife Area (Ponds 9-13) during Audubon Society Christmas Bird Counts (Stockton Chapter), 1984-1993 (except 1985).

<u>Common Name</u>	<u>Scientific Name</u>	<u>Locations Observed</u>
Loon	Gaviidae	
Common loon	<i>Gavia immer</i>	7
Grebes	Podicipedidae	
Horned grebe	<i>Podiceps auritus</i>	12
Pied-billed grebe	<i>Podilymbus podiceps</i>	5,7,9,11,12,13*
Cormorants	Phalacrocoracidae	
Double-crested cormorant	<i>Phalacrocorax auritus</i>	6,9,10,11,12,13*
Hérons	Ardeidae	
American bittern	<i>Botaurus lentiginosus</i>	6,9,11,12*
Black-crowned night-heron	<i>Nycticorax nycticorax</i>	5,7,11*
Green heron	<i>Butorides striatus</i>	5,6,7,9,10,11,12,13*
Cattle egret	<i>Bubulcus ibis</i>	*
Snowy egret	<i>Egretta thula</i>	7,11*
Great egret	<i>Casmerodius albus</i>	5,6,7,10,11,12,13*
Great blue heron	<i>Ardea herodias</i>	6,7,9,10,11,12,13*
Cranes	Gruidae	
Lesser sandhill crane	<i>Grus canadensis canadensis</i>	5,6,9,10*
Greater sandhill crane	<i>Grus canadensis tabida</i>	5,6,9,10*
Swans, geese, ducks	Anatidae	
Tundra swan	<i>Cygnus columbianus</i>	*
Greater white-fronted goose	<i>Anser albifrons</i>	*
Snow goose	<i>Chen caerulescens</i>	*
Canada goose	<i>Branta canadensis</i>	*
Mallard	<i>Anas platyrhynchos</i>	6,7,9,10,11,13*
Gadwall	<i>Anas strepera</i>	7,11
American widgeon	<i>Anas americana</i>	10*
Northern pintail	<i>Anas acuta</i>	*
Cinnamon teal	<i>Anas cyanoptera</i>	7
Ruddy duck	<i>Oxyura jamaicensis</i>	*
Wood duck	<i>Aix sponsa</i>	11*

<u>Common Name</u>	<u>Scientific Name</u>	<u>Locations Observed</u>
Swans, geese, ducks (cont.)	Anatidae	
Canvasback	<i>Aythya valisineria</i>	*
Ring-necked duck	<i>Aythya collaris</i>	*
Lesser scaup	<i>Aythya affinis</i>	*
Common golden eye	<i>Bucephala clangula</i>	*
Bufflehead	<i>Bucephala albeola</i>	*
Common merganser	<i>Mergus merganser</i>	*
Muscovy X sp.	<i>Cairina X sp.</i>	9
Rails, gallinules, coots	Rallidae	
Virginia rail	<i>Rallus limicola</i>	9,11*
Sora	<i>Porzana carolina</i>	7,11*
California black rail	<i>Laterallus jamaicensis coturniculus</i>	11
Common moorhen	<i>Gallinula chloropus</i>	*
American coot	<i>Fulica americana</i>	6,7,9,11,13*
Stilts and Avocets	Recurvirostridae	
Black-necked stilt	<i>Himantopus mexicanus</i>	*
Plovers	Charadriidae	
Killdeer	<i>Charadrius vociferus</i>	5,6,7,9,10,12*
Black-bellied plover	<i>Pluvialis squatarola</i>	12*
Sandpipers	Scolopacidae	
Greater yellowlegs	<i>Tringa melanoleuca</i>	10,11*
Lesser yellowlegs	<i>Tringa flavipes</i>	*
Long-billed dowitcher	<i>Limnodromus scolopaceus</i>	*
Common snipe	<i>Gallinago gallinago</i>	6,12*
Dunlin	<i>Calidris alpina</i>	*
Western sandpiper	<i>Calidris mauri</i>	*
Least sandpiper	<i>Calidris minutilla</i>	*
Skuas, Jaegers, Gulls, Terns	Laridae	
Bonaparte's gull	<i>Larus philadelphia</i>	10*
Ring-billed gull	<i>Larus delawarensis</i>	*
California gull	<i>Larus californicus</i>	*
Western gull	<i>Larus occidentalis</i>	7
Forster's tern	<i>Sterna forsteri</i>	11,13*
American vultures	Cathartidae	
Turkey vulture	<i>Cathartes aura</i>	5,6,9,10,11,12,13*

<u>Common Name</u>	<u>Scientific Name</u>	<u>Locations Observed</u>
Kites, hawks, eagles	Accipitridae	
White-tailed kite	<i>Elanus caeruleus</i>	7,9,10,11,12,13*
Northern harrier	<i>Circus cyaneus</i>	5,7,9,10,11,12,13*
Sharp-shinned hawk	<i>Accipiter striatus</i>	9*
Cooper's hawk	<i>Accipiter cooperii</i>	6,12
Red-shouldered hawk	<i>Buteo lineatus</i>	10,11,12*
Red-tailed hawk	<i>Buteo jamaicensis</i>	6,7,9,10,11,12,13*
Swainson's hawk	<i>Buteo swainsoni</i>	6,10,11,12
Ferruginous hawk	<i>Buteo regalis</i>	13
Falcons and caracara	Falconidae	
American kestrel	<i>Falco sparverius</i>	*
Merlin	<i>Falco columbarius</i>	*
Prairie falcon	<i>Falco mexicanus</i>	*
Grouse and ptarmigans	Phasianidae	
California quail	<i>Callipepla californica</i>	12,13*
Ring-necked pheasant	<i>Phasianus colchicus</i>	5,6,7,9,10,11*
Pigeons, doves	Columbidae	
Rock dove	<i>Columba livia</i>	*
Mourning dove	<i>Zenaida macroura</i>	5,6,7,9,10,11,12,13*
Barn owls	Tytonidae	
Common barn owl	<i>Tyto alba</i>	6,7,9,10*
Typical owls	Strigidae	
Short-eared owls	<i>Asio flammeus</i>	*
Great horned owl	<i>Bubo virginianus</i>	6,9,10,13*
Hummingbirds	Trochilidae	
Anna's hummingbird	<i>Calypte anna</i>	10
Kingfishers	Alcedinidae	
Belted kingfisher	<i>Ceryle alcyon</i>	5,6,7,9,11,12,13*
Woodpeckers	Picidae	
Northern flicker	<i>Colaptes auratus</i>	5,6,10,11*
Downey woodpecker	<i>Picoides pubescens</i>	9,12*
Nuttall's woodpecker	<i>Picoides nuttallii</i>	5,6,10*

<u>Common Name</u>	<u>Scientific Name</u>	<u>Locations Observed</u>
Tyrant flycatchers	Tyrannidae	
Western kingbird	<i>Tyrannus verticalis</i>	5,6,7,13
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>	5,13
Black phoebe	<i>Sayornis nigricans</i>	5,6,7,9,10,11,12,13*
Swallows	Hirundinidae	
Tree swallow	<i>Tachycineta bicolor</i>	6,7,9,10,11,12,13*
Violet-green swallow	<i>Tachycineta thalassina</i>	7,13
Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	13
Cliff swallow	<i>Hirundo pyrrhonota</i>	5,6,7,10,11,12,13
Barn swallow	<i>Hirundo rustica</i>	5,6,7,11,13
Jays, crows, magpies	Corvidae	
Scrub jay	<i>Aphelocoma coerulescens</i>	5,7,9,13*
Yellow-billed magpie	<i>Pica nuttalli</i>	*
American crow	<i>Corvus brachyrhynchos</i>	5,6,7,9,10,11,12,13*
Titmice and chickadees	Paridae	
Plain titmouse	<i>Parus inornatus</i>	*
Bushtits	Aegithalidae	
Bushtit	<i>Psaltirparus minimus</i>	5,12*
Wrens	Troglodytidae	
House wren	<i>Troglodytes aedon</i>	*
Bewick's wren	<i>Thryomanes bewickii</i>	*
Marsh wren	<i>Cistothorus palustris</i>	6,7,9,11
Thrushes	Muscicapidae	
Golden-crowned kinglet	<i>Regulus satrapa</i>	*
Ruby-crowned kinglet	<i>Regulus calendula</i>	7,9*
Mountain bluebird	<i>Sialia mexicana</i>	*
Swainson's thrush	<i>Catharus ustulatus</i>	*
Hermit thrush	<i>Catharus guttatus</i>	*
Varied thrush	<i>Ixoreus naevins</i>	*
American robin	<i>Turdus migratorius</i>	5,6,7,10,12*
Shrikes	Laniidae	
Loggerhead shrike	<i>Lanius ludovicianus</i>	9
Mimic thrushes	Mimidae	
Northern mockingbird	<i>Mimus polyglottos</i>	5,6,11*

<u>Common Name</u>	<u>Scientific Name</u>	<u>Locations Observed</u>
Pipits, Wagtails	Motacillidae	
American pipit	<i>Anthus rubescens</i>	10*
Starlings	Sturnidae	
European starling	<i>Sturnus vulgaris</i>	5,7,9,11*
Vireos	Vireonidae	
Hutton's vireo	<i>Vireo huttoni</i>	*
Warblers, sparrows	Emberizidae	
Orange-crowned warbler	<i>Vermivora celata</i>	11*
Yellow-rumped warbler	<i>Dendroica coronata</i>	6,7,9,10,11,12,13*
Yellow warbler	<i>Dendroica petechia</i>	11
Common yellowthroat	<i>Geothlypis trichas</i>	6,7,9,10,11,12*
Blue grosbeak	<i>Guiraca caerulea</i>	10
Rufous-sided towhee	<i>Pipilo erythrophthalmus</i>	5,6,7,9,10,11,12,13*
Brown towhee	<i>Pipilo fuscus</i>	5*
Savannah sparrow	<i>Passerculus sandwichensis</i>	11*
Song sparrow	<i>Melospiza melodia</i>	5,6,7,9,11,12,13*
Lark sparrow	<i>Chondestes grammacus</i>	*
Dark-eyed junco	<i>Junco hyemalis</i>	6*
White-throated sparrow	<i>Zonotrichia albicollis</i>	7*
White-crowned sparrow	<i>Zonotrichia leucophrys</i>	7,9,11,13*
Golden-crowned sparrow	<i>Zonotrichia atricapilla</i>	*
Fox sparrow	<i>Passerella iliaca</i>	5*
Lincoln's sparrow	<i>Melospiza lincolnii</i>	*
Western meadowlark	<i>Sturnella neglecta</i>	6,7,9,10*
Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>	11
Red-winged blackbird	<i>Agelaius phoeniceus</i>	5,6,7,9,11,12,13*
Tricolored blackbird	<i>Agelaius tricolor</i>	11*
Brewer's blackbird	<i>Euphagus cyanocephalus</i>	5,6,9,13*
Brown-headed cowbird	<i>Molothrus ater</i>	5,6,12,13
Northern oriole	<i>Icterus galbula</i>	6,10
Hooded oriole	<i>Icterus cucullatus</i>	12,13

Common Name**Finches**

American goldfinch

Lesser goldfinch

Purple finch

House finch

Scientific Name**Fringillidae***Carduelis tristis**Carduelis psaltria**Carpodacus purpureus**Carpodacus mexicanus***Locations Observed**

7,9,10*

5,6,7

*

5,6,7,10,11,13*

Weavers

House sparrow

Passeridae*Passer domesticus*

5,6*

*Printed by
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